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Per. G.A. Wilts 8° 62

TWENTY-FIFTH HALF-YEARLY

REPORT

OF THE

MARLBOROUGH COLLEGE

Natural History Society,

(FOUNDED APRIL 9th, 1864,)

FOR THE

HALF-YEAR,

ENDING MIDSUMMER, 1877.

"Tum mihi Naturæ libeat perdiscere mores:
Quis Deus hanc mundi temperet arte domum."

MARLBOROUGH:
PRINTED BY PERKINS AND SON, "TIMES" OFFICE.
1877.

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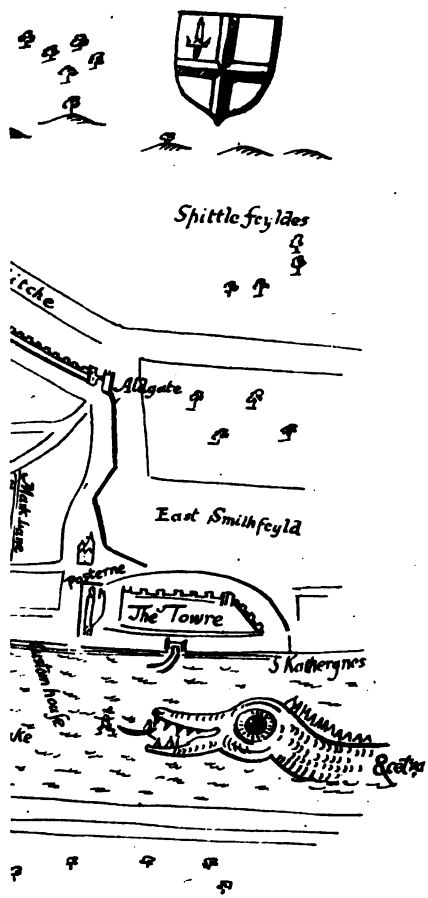
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1877.

PREFACE.

THE preface to the last Report commenced with the following sentence: 'From some cause or other the popularity of the Society among members of the School has diminished, which has been strikingly shown by the great decrease in the number of its members:' if 'increased' be read instead of 'diminished', and 'increase' instead of 'decrease' the present condition of the Society will be correctly stated. The change is so great, that, after having only 23 members at the end of last year, we now number 85; never before have we numbered more than 50. To the casual observer this would seem to denote an unusually prosperous condition. But this term has certainly shown the un-'desirablity of having a large number of members.' The motive which actuated the majority in joining is easily seen from the following fact; a week before the time fixed for our first Field-day, there were under 40 members in the Society, and by the end of the week the list had risen to over 70, so that for the first time in the Society's existence more put down their names for the Field-day than could be provided for. Evidently therefore the Field-days and Museum are the attractions which induce the majority to join, but the consequent increase in Natural History work is by no means great. However, arrangements have been made by which it will be impossible in future to use the Museum as an ordinary class-room, and the previous amount of damage consequent on its being so used will be prevented.

The amount of practical work done has certainly not increased. By a diligent collection of notices recorded by Mr. MASTERMAN, BALFOUR and others, a fair list of Ornithological notices has been obtained. Entomology has revived, as is evidenced by the long list of notices observed by MANDERS and ELTON; the long list of botanical notices again represents the work of only a few, chiefly Messrs. THOMPSON, MACDONALD, DELISLE, and THORPE among

the Masters, and MILNER among members of the School; Geology seems to have been entirely abandoned.

The attendance at the meetings has been very good, as indeed is natural considering the number of Members; at two meetings in succession the attendance was over 100, a number reached in only two instances during the previous existence of the Society.

The produce of two terms in the way of papers to print in the Report is very scanty; some of the lectures were only delivered from notes, and so only abstracts can be given of them. Masters have again kindly come forward to enliven our meetings; of the interesting paper on 'Dogs' by G. A. DAWSON, Esq., only an epitome appears. G. F. RODWELL, Esq.'s most instructive lecture on the 'Atomic Theory of Lucretius' is printed at full length, as also the very interesting and valuable paper by F. E. THOMPSON, Esq., on English Life in the time of Shakespeare.

As usual, members of the School have been but poorly represented, J. H. C. DALTON'S paper on the 'Starry Worlds' being the only one not read by a Master.

Our funds still remain very satisfactory, as may be seen from the fact that the balance in hand increases every half-year.

The last Report did not experience so good a sale as its immediate predecessors, and in compressing the present one into as short a compass as possible, the Committee hope they are meeting the wishes of the School, and that they will not cease to shew that interest in the Society, of which the sale of the Report has always afforded a proof.

In conclusion the Committee wish to express their obligations to those friends who have kindly aided the Society by donations; a full list of these is given elsewhere.

LIST OF MEMBERS.

President :
Rev. T. A. Preston.

Secretary :
W. M. H. Milner.

Librarian :
G. P. V. Hume.

Committee :

The Ex-Officio Members.
G. F. Rodwell, Esq.
F. E. Thompson, Esq.
J. H. C. Dalton.

Honorary Members :

F. E. Thompson, Esq.	H. A. Evans, Esq.	R. E. Price, Esq.
W. E. Mullins, Esq.	Rev. J. W. Mills.	Capt. R. B. Reed.
Rev. J. Sowerby.	W. W. Fowler, Esq.	H. J. Verrall, Esq.
Rev. G. G. Bradley, D.D.	C. Sankey, Esq.	E. Meyrick, Esq.
C. M. Bull, Esq.	A. H. Beesly, Esq.	C. W. Bourne, Esq.
W. Fergus, Esq., M.D.	F. E. Hulme, Esq., F.L.S.,	H. D. Drury, Esq,
S. B. Dixon, Esq., F.G.S.	F.S.A.	Rev. C. Soames.
W. H. Macdonald, Esq.	Rev. C. E. Thorpe.	H. P. Dixon, Esq.
J. F. Duthie, Esq.	Rev. J. S. Thomas.	W. A. Clarke, Esq.
G. H. Dawson, Esq.	Rev. F. W. Farrar, D.D.,	Rev. W. M. Furneaux.
Rev. A. C. Almack.	F.R.S.	Rev. A. C. Smith.
E. F. im Thurn, Esq.	W. P. Sellick, Esq.	J. B. Fuller, Esq.
G. K. Mills, Esq.	H. C. Spry, Esq.	A. E. Garrod, Esq.
W. Mansell, Esq.	G. F. Rodwell, Esq.	T. O. Harding, Esq.
Rev. G. W. DeLisle.	W. D. Fenning, Esq.	Rev. G. C. Bell.

Members—Lent Term :

W. M. H. Milner	A. E. Aldworth	P. Caldecott
J. H. C. Dalton	C. B. Stewart	E. N. Gardiner
G. P. V. Hume	A. C. D. Pigott	W. H. Chappel
C. W. B. Jones	H. Crookenden	F. W. Nott
G. R. Rogers	J. A. H. Craufurd	H. A. Clark
M. Rogers	H. D. Rolleston	S. Swann
T. A. Goddard	F. M. Lucas	T. L. Kesteven
E. G. Waddilove	W. A. Pemberton	F. Alston
G. N. Going	V. G. Daltry	H. R. Hordern
R. B. Dods	T. V. Pigott	W. H. M. D'Urban.

Members—Midsummer Term :

W. M. H. Milner
J. H. C. Dalton
G. P. V. Hume
C. W. B. Jones
G. R. Rogers
M. Rogers
E. G. Waddilove
G. N. Going
R. B. Dods
A. E. Aldworth
C. B. Stewart
A. C. D. Pigott
H. Crookenden
J. A. H. Craufurd
H. D. Rolleston
F. M. Lucas
W. A. Pemberton
V. G. Daltry
T. V. Pigott
P. Caldecott
E. N. Gardiner
W. H. Chappel
F. W. Nott
H. A. Clark
S. Swann
T. L. Kesteven
F. S. Alston
H. R. Hordern
W. H. M. D'Urban

L. H. Winckworth
W. B. A. Wynyard
E. G. Lowder
P. H. Eliot
E. M. R. Cox
J. C. Priestley
E. Mahon
C. H. Hill
G. C. Alston
C. H. Villiers
O. Elton
S. R. Baker
F. Duncan
A. W. Bird
D. Dobie
R. F. Yorke
A. J. Burgess
W. M. Richards
C. A. Osborne
J. U. Coates
H. H. Finch
G. Bagge
A. G. Daubeney
S. A. Pearse
F. E. Corbett
R. H. Cunningham
L. G. Dumbleton
A. W. S. Taylor

W. B. Bent
H. M. Leaf
A. B. Whatton
E. A. W. Stotherd
F. H. Fox
G. Fox
H. F. Wright
W. H. Nelson
R. H. Whitaker
P. W. Woolley
C. E. Pine-Coffin
R. B. Thompson
A. L. Wright
F. S. Robinson
F. Street
H. J. Cooper
T. D. Harrison
B. G. Smithe
A. H. Davis
L. Youngs
A. S. Dumbleton
H. G. C. Hardwick
E. Feetham
R. F. Fox
H. H. James
W. D. H. Petter
C. F. Dawson
E. C. Vincent.

EXTRACTS FROM THE RULES.

That this Society be called the Marlborough College Natural History Society.

Constitution.

That the Society consist of Members and Honorary Members.

Officers.

That the Officers of the Society consist of a President, Secretary, Treasurer, Librarian, and Curator.

Election of Officers.

That the President have the absolute power of nominating the Secretary.

That those Members of the Committee, who are not ex-officio Members, be elected terminally, and that the retiring Members be eligible for re-election.

That the same rule apply to the Treasurer, Librarian, and Curator.

Management.

That the affairs of the Society be conducted by a Committee, consisting of the President, Secretary, Treasurer, and three other Members of the Society, to be elected from and by Members of the Society; three of whom shall form a quorum.

President.

That in case of an equality of votes, the President shall have a double or casting vote.

Secretary.

That the duty of the Secretary be to summon meetings (when necessary) of the Society; to keep a detailed report of the proceedings, as well as lists of Members and Visitors present at each meeting, and generally to act under the direction of the Committee in all matters connected with the welfare of the Society.

Librarian.

That the duties of the Librarian be to keep a Catalogue of the Library, with the names of the donors, and to see that the Library Regulations are carried into effect.

Curator.

That the Curator be responsible for the order of the Museum.

Library.

That any Member of the Society be at liberty to consult any of the books belonging to the Society, but that only certain volumes, to be decided on by the Committee, be allowed to be taken from the room.

That members of the Society be permitted to use the Museum at such hours as the Committee shall appoint; but that in the afternoon it be used exclusively for the purposes of Natural History.

Botanical Garden.

That the Garden be under complete control of the President, or of some person appointed by the President.

That the Garden be open to Members of the Society at all times, and that each Member be allowed to introduce one visitor.

Field Days.

That the Field Days be confined *entirely* to Members of the Society, and that the President appoint a day on which names must be given in.

Members.

That the election of new Members rest entirely with the Committee.

That every member pay a terminal subscription of 2s., to be paid at the first meeting of the Society in that term.

That if a Member be elected after the commencement of the term, the amount of his subscription for that term shall be settled by the Committee.

That Members have the right to introduce two visitors at all general meetings of the Society; to have personal access to the Museum, and to introduce a visitor at such times as shall seem fit to the Committee.

Honorary Members.

That Honorary Members have all the privileges of Members except the power of introducing a Member of the School to the meetings of the Society.

That Honorary Members pay 5s. a half-year, for which they shall be entitled to a copy of the Report.

That Honorary Members may compound for all future subscriptions by the payment of a sum of two guineas.

Suspension of Members.

That any member be liable to be excluded from the Society by the Committee, if, in their opinion, he shall have failed to show sufficient energy in the working of the Society.

Sections.

That the Society consist of sections to be formed for the more accurate study of the different branches of Natural History, and that every Member must belong to a Section.

That the question of the number of Sections be left open for settlement at the beginning of each term.

New Rules.

That any member of the Society have power to propose any new rule or any alteration in an old one, provided the motion be seconded by another Member.

MEETING HELD FEBRUARY 1st, 1877.

The following arrangements were made :—

Mr. Rodwell, Mr. Thompson, and G. P. V. Hume were elected on the Committee.

Mr. Thorpe was elected Treasurer, and G. P. V. Hume Librarian.

J. H. C. Dalton was subsequently also elected on the Committee.

The Meetings for the Term were fixed for Thursday, Feb. 8th, 22nd, and March 8th, 22nd.

There were no Sections appointed.

MEETING HELD FEBRUARY 8th, 1877.

J. H. C. Dalton read a paper on the "Starry Worlds," after which the following exhibitions were made :—

A groat of Henry VIII. (2nd issue) presented by Mr. Chivers.

Pemmican from the late Arctic Expedition by C. E. B. Ord, Esq., O.M.

Frog by W. S. M. D'Urban, Esq.

Hornet's nest by R. F. Cholmeley.

The President also exhibited some boughs of Birch Trees, which had been curiously broken longitudinally by the weight of the Snow which fell on them on December 24th; and a fine specimen of Sea Mouse (*Halithea aculeata.*)

There were 31 persons present, 1 Hon. Member, 17 Members, and 13 Visitors.

THE STARRY WORLDS.

For several years people supposed that the earth was a platform, and that if anyone went far enough he would come to the edge of it, as at the sea shore. They were of opinion that the sun set in the sea and rose out of it; and the Greeks invented wonderful contrivances for bringing the sun under the earth in the night time, from west to east. Since then, for several hundred years, the earth was considered as the centre of the universe, and it was thought that the sun, planets, and stars revolved round it. Galileo, in the 17th century, first determined that the earth revolved round the sun,

and that the sun itself was not the centre of the universe, but that it moved in space around a centre.

Before I speak about the stars I should like to say a few words about the solar system. The sun is the centre of the solar system, and round it all the planets revolve. It is probably a huge mass of incandescent matter, in which there is heat enough to liquefy or even vaporize solid bodies, like carbon and lime, which we cannot melt even with the electric light; also on account of its immense volume and weight, there is pressure enough to liquefy, or even solidify the permanent gases. The heat of the sun is probably generated by a contraction in its mass. It has been shewn that a very small contraction in its mass would be sufficient to give out as much heat as it now does, for four or five thousand years. The planets are worlds something like ours, which revolve round the sun and rotate round their own axis. Mercury is too near the sun to be examined; Venus has been examined by different astronomers; it is nearly as large as the earth, and (with the exception of the moon) it is the nearest planet, it has an atmosphere quite as high and dense as ours. The plane of its ecliptic is inclined at an angle of 60° with the equator. Thus there is no temperate zone, but the frigid and torrid overlap. So at one part of the year there is a heat ten or eleven times as great as here on the hottest day at the equator, while at another time in the same place there is cold greater than in the Arctic Regions. Thus it is very improbable that Venus is inhabited by people like ourselves.

The planet next the earth on the other side is Mars, it is about a quarter the size of the earth. The appearance of the soil of Mars is ruddy, and it has a rather dense atmosphere. It has all the physical features of a planet on which we ourselves could live; and it is very probable that rational beings like ourselves are living upon it.

Next come the Asteroids, which have probably been caused by a planet about the same size as Mars splitting up into various small planets. The largest is not much bigger than our moon. There are about 180 of them, but none can be seen with the naked eye.

Next comes *Jupiter*, which is twice as large as all the other planets put together. It has great belts round it, and is attended by five moons. Through a telescope vast cyclones (or storms) can be seen to sweep across its surface, just at the same time as the cyclones in the sun are observable; the quantity of light that it gives out to us is greater than if it simply shone with reflected light alone. The weight of Jupiter is not much greater than that of the earth; thus the matter of which Jupiter is composed is very light, it is of about the same specific gravity as the sun. From these and other considerations it is probable that Jupiter is a small sun that gives light to its satellites, which are probably now inhabited.

The next three planets—Saturn, Uranus, and Neptune are also supposed to be a little luminous.

Thus it is almost certain that in the solar system there are other inhabited worlds than ours, and that all the planets if not now inhabited, were once so, or will be shortly.

The belief that the earth alone of all worlds is inhabited, can receive little credit, for if the planets contain no living creatures, why were they then created merely to adorn the sky and perplex astronomers.

And if the planets afford strong evidence that there are other worlds than ours that are inhabited, it will be readily conceived that the stars which travel elsewhere through space, are not unfit abodes for the present inhabitants of the earth.

The distance of the fixed stars from the earth is very great, and it is quite impossible to determine at all the distance of some of them. The star nearest the earth is α-Centauri, in the southern hemisphere. Its annual parallax (so to speak) is about 2" (seconds); and accordingly, by trigonometry, its distance has been found to be 19 billion miles, 200,000 times the distance of the earth from the sun, or about 10,000 times the distance of the furthest planet, Neptune. Thus since light takes 8¼ minutes to come here from the sun, it will take above three years to come from this star. In fact the distance from some stars is so great that if they were now blotted out from the heavens, their light which travels at the rate of 190,000 miles a second, would be visible to us for more than a thousand years. Sirius, the brightest star in the heavens, gives a very small parallax, and according to calculation it is about six times as far as α-Centauri, or above a million times as far as we are from the sun. As a rule the stars which appear bright are not so distant as the fainter ones.

On a clear night we see about 3000 stars at once, but they are almost innumerable in reality. Even the number visible with telescopes is beyond all counting; roughly speaking, with a moderately sized telescope about five millions can be seen. The stars have no apparent diameter to us because they are so far away. Now and then some people have fancied they could discern some apparent disc of some very bright star, but it has turned out to be a spurious disc, with rings round it; which is one of the consequences of the undulatory theory of light. A planet in a telescope looks larger than a fixed star because, since it has an apparent diameter, it can be magnified, while the stars cannot. Again, when the dark edge of the moon comes over a star it eclipses it at once, which shews that all the rays from the star are particularly close together, as if it were a point.

The stars are probably suns constituted like our own, some being larger and some smaller. It can be shewn that the stars are constituted of the same kind of material as our sun, by the method of spectrum analysis, which

was explained at a meeting here, two or three terms ago. Taking, for instance, the star Aldebaran in the constellation of Taurus, and comparing its spectrum with that of the sun, we can see that vapours exist in both, and also iron and other known elements, as mercury, hydrogen, etc. Now if these elements exist in our sun and on our earth and also in the sun Aldebaran, we infer they exist in the planetary orbs surrounding Aldebaran; and without knowing anything of these bodies, we are yet able to pronounce that they are all supplied with elements known to man, and we infer the existence not only of living creatures but also of rational beings. Other stars have been analysed in the same manner, and have been shewn, with a few exceptions, to be constituted of nearly the same material. Accordingly this theory is very probable that almost every star in the universe is a sun, some larger and some smaller than our sun, and that planets revolve round these stars, as the planets revolve round our sun, and that in all these planets living creatures are contained like as on our earth. We see then in our sidereal system a series of suns like our own in all essential respects. It is probable that thousands of systems are unfit for habitation by human races, and that the races subsisting in them would perish, if subjected to the condition prevailing in any part of the Solar system. Still on this one point we may be well assured; whatever be the nature of these beings and to whatever conditions they may be subjected, still perfect adaptation exists between them and the worlds on which they live; for this earth, ever since it has been created, has been gradually changing. Animals that lived before the flood are no longer on the earth now, and men formerly had much longer lives than now. Again many animals and plants which will thrive in one climate will die in another. Also Geology has given convincing proof that animal and vegetable life has existed upon this earth before it was fitted for man; and that it was at a much later period when the sun broke through the watery vapours on the earth, and man was created. Thus we may be quite certain that life exists out of the solar system.

The stars are not all the same colour, in this part of the world the colours of stars are not very clearly marked, but in the tropics they are very distinguishable. Many are red, green, and all colours. The different colours are probably due to the presence of vapours round the star which absorb some of its light; for instance, if a star is green, there will be an atmosphere round it which has the power of absorbing all the red rays and letting the green pass through.

In the heavens many double stars can be seen. A double star is when two stars are seen close together and known to be quite near one another. These double stars are generally coloured, and one of the two stars has always the complimentary colour to the other. Thus if one was red, the the other would be green, and if one was blue, the other would be orange, etc.

These suns probably revolve round one another, and have planetary systems to revolve round their centre of gravity. Two colours are said to be complimentary, when mixed together they produce white light.

Bright patches in the sky like a shining mist of definite size are called nebulae, whether they are large or small, or resolvable into stars by telescopes or not. The telescope of Lord Rosse has resolved a great many nebulae into stars, which no other telescope had been able to do. Accordingly, many people were of opinion that all nebulae are resolvable into stars, but this is a mistake, for some nebulae cannot be resolved, but are probably some solar system in course of formation; for the nebular theory is this,—in the beginning, before our solar system was formed, it consisted of a huge mass of nebulous matter which was rotating round; whilst rotating it would throw off a ring which would quickly collect together and become a satellite; which would both rotate round its own axis and revolve round the mass. It would give out another which would form another planet, and thus all the planets would be formed which would rotate round their own axis, and revolve round the mass, which would be the sun. Thus if the nebular theory be true, it is probable that all the nebulae we now see are solar systems in course of formation.

There yet remains the question are the stars in motion? and if so, what kind of motion? We can answer the first part of the question in this way—Nothing can be at rest where mutual attraction is universal, therefore either the stars are all moving to destruction and chaos at a common centre, or else they keep their distance by revolving round it. By careful observation Herschel discovered the sun, which is a star, moves towards the constellation Hercules, at the rate of three or four miles a second; he found it out by ascertaining that at a certain point in the constellation Hercules, the stars did not appear to change, while on the right and left they began to open out.

Thus the sun together with all the planets is passing away from the neighbourhood of Sirius, and is urging on his way to a place between Lyra and Hercules. Of the true habitation of those regions of space, through which he is bearing, and has lately borne his planets, we know little. But if we look back, and see the richness of those regions he has left behind, and then look on and see the richness of those regions towards which he is wending his way, the conception is suggested that now he is wending his way through a relatively barren district, and that he has left and will again revisit more glorious star depths. The path of the sun is inclined at an angle of 53° to the plane of the earth's orbit and with 15 in advance of Capricornus.

He travels nearly as fast as the earth travels round the sun, at about three or four miles a second, and therefore the earth moves in a skew spiral or helicoidal path.

Beside the sun, all the other stars move in space in a somewhat similar manner. The direction of many stars has been noticed, and it is seen that many stars travel together, for instance, 5 out of the 7 large stars of Ursa Major travel in the same direction, while the other two travel in an opposite direction. The stars which are visible to the naked eye are said to be of one of the first six orders of magnitude, 2½ of the brightest like Sirius or Aldebaran are called stars of the first magnitude, 60 not quite so bright, like the Pole star, or α Centauri, are said to be of the 2nd, and so on to the sixth. These divisions however are quite arbitrary.

The stars appear always in the same relative positions. This fact was known to the ancients who mapped them out in figures of men and beasts, etc., this classification, although uncouth and unscientific, is one of the best helps we yet have to a knowledge of them. The usual way of mapping them out is on a celestial globe. On this globe however the stars are drawn the reverse of what they appear in the sky, and so it is difficult to recognise them.

The length of my paper forbids that I should give the whole of the constellations, but I have said enough to give you a general idea of their immensity; and I think there is nothing that can give such a good idea of the might and majesty of the God-head or of the insignificance of man, as the study of this vast and important subject.

ECLIPSE OF THE MOON.

On Tuesday, February 27th, 1877, a total eclipse of the moon took place. The moon began to be obscured shortly before it appeared above the horizon, but on account of the thickness of the atmosphere, it was not to be seen till a quarter to six, and when about five-sixths of it was already covered. At half-past six the total phase began, but then a curious phenomenon presented itself; a large portion of the moon's disc, especially the right side about 30° from the vertex, assumed a dark red colour which gradually extended downwards till at a quarter past seven, the time of the middle of the eclipse, the whole of the moon's disc except a little in the centre had this peculiar tint. This red light is owing to the sun's rays of light which fall on the atmosphere of the earth, and get refracted on to the moon; and the colour is red because the vapours in the earth's atmosphere have the power of absorbing the green rays of light and letting the red pass through. After a quarter past seven, as might be expected, exactly a reverse process took place, until the colour at last disappeared on the left side about 150° from the vertex. The total phase ended at about 8 o'clock when a luminous crescent appeared on the left; a few minutes afterwards, it presented the appearance of a new moon about 3 days old, and by nine o'clock it was wholly uncovered.

The magnitude of the eclipse was 0·76 of the moon's diameter and it is the best we shall have for at least 40 or 50 years. The moon was visible during the whole time of the total phase.

MEETING HELD FEBRUARY 22ND, 1877.

G. H. Dawson, Esq., delivered an interesting lecture on the Sagacity of Dogs.

After alluding to some of the stories of dogs in ancient literature, especially that of Ulysses' dog remembering him on his return, when everyone else could not recognise him, it was curious to notice how few stories of dogs there are in the Bible and in good literature, though in some ways the dog may be considered on a level with man in intelligence. The following stories of dogs to confirm this statement are taken from what may be considered reliable authorities, and no anecdote will be mentioned to which there may be considered any reasonable doubt.

The first class of anecdotes will relate to the fact of Dogs at times not only knowing money, when they see it, but also its value. A dog at Greenwich Hospital used to receive regularly as a pension, 1d. a day; as soon as this was given to him he would go off to a cook-shop and buy *two* half-penny worths of meat, as he had found that he could procure more for it in that way than if he received a pennyworth at once. Another dog used to beg for money and on receiving a penny, he would go to the confectioner's and buy a particular kind of bread, refusing any other kind that might be offered him. It must be observed that such stories almost invariably refer to retrievers, though some few Scotch stories also illustrate this fact.

Another peculiarity is that dogs frequently know when it is Sunday, and will not even attempt to go out with the family on that day.

Another peculiarity is that they occasionally know words when they hear them, even when not spoken *to* them. On one occasion during the Church Service, when several turnspit dogs were present, the word "Spit" occurred in the Lesson, whereupon all the dogs at once rose up and went out of Church.

Again: a dog belonging to a Scotch farmer was apparently asleep before the fire, when the farmer, who was talking to a stranger, said in the course of conversation without altering his voice "the cow is among the cabbages," whereupon the dog at once got up, jumped through an open window, went to the field and not finding the cow there visited the cowshed, and seeing all

safe, returned and lay down again before the fire. This was done 3 times, till at last the dog merely got up when the words were repeated, and looking out of window and seeing all safe, returned to the fire again. Such stories are very commonly told of Sheep Dogs.

Some instincts are peculiar to certain breeds of dogs; thus among sporting dogs, pointers will stay motionless the moment game is detected, and will remain in the same position for an immense time if the birds do not stir, even for hours. One dog whilst getting over a gate heard the gun go off just as it was at the top, and there it remained till called off. Setters again have their peculiarities, though of a different kind, and well-trained dogs when out together will each follow his own peculiarity. One old Setter, out with a young pointer which had not been properly trained, was observed to correct the pointer and show him what to do, and then return to its own duties, but this is a peculiarly rare incident.

Dogs have again a powerful instinct of love for home, and many are the stories of the marvellous manner in which they will find their way home, even when it seemed impossible for them to find it.

In fact so numerous are the stories of instinct that any dog of a good breed is sure to afford examples, and will prove a fit subject of study and observation.

Mr. BELL mentioned the case of his own dog who nearly killed herself by over-exertion in "singing," this accomplishment consisting of standing on her hind legs and giving a prolonged howl, for the sake of a piece of sugar, of which she was particularly fond. Other stories of her showed that her appreciation of Sunday was by no means strong, and her power of discrimination very slight in some particulars. Mr. Bell also pointed out that these cases of instinct were hardly in accordance with Darwin's Theory of the development of the intellect. Instinct is *limited*: we can teach a dog to do certain things, but *only* those things, *e.g.*, a *setter* can do one thing and only that, and any amount of education will not enable it to do more: with human beings, a man can be trained to different professions or trades or occupations according as he is taught in his younger days, the result depending *not* on the limitation of the capacity of the mind, but of the instruction imparted.

The PRESIDENT remarked that all these stories must be taken with great caution, a colouring often being given to them unintentionally by the narrator.

The President exhibited a fine specimen of a Queen Termite, and also specimens of a Centipede and a Locust from Brazil.

There were 45 persons present, including the Rev. G. C. Bell; 2 Hon. Members, 18 Members, and 25 Visitors.

MEETING HELD MARCH 15TH, 1877.

THIS Meeting had been postponed from March 8th. G. F. Rodwell, Esq., read a paper on the Atomic Theory of Lucretius, after which some coins, found at Mildenhall and presented to the Society by Mr. Chivers, were exhibited. A case had also been put on the table for the Exhibition of any objects of interest, which members might feel inclined to put into it: on the present occasion there were a fine King-Crab; wood coloured green by a fungus (*Peziza æruginosa*); and a few "first eggs" of the year.

There were 44 persons present, among them Mr. Bull, Mr. Upcott, and Mr. Thompson; 3 Hon. Members, 13 Members, and 28 Visitors.

LUCRETIUS AND THE ATOMIC THEORY.

I SHOULD scarcely have ventured to talk to you this evening about so dry and apparently unpromising a subject as the Atomic Theory, had it not been suggested to me by Mr. Thompson, that as many of you were reading Lucretius last Term, and as in so doing you made the acquaintance of a theory which has in some form or other always been accepted and adopted by science, it might be interesting to discuss it from a scientific aspect alone. This is indeed one of those rare instances in which a classical subject and a subject of science can, to some extent at least, go hand in hand. But I do feel that after the Epicurean and Lucretian dainties to which you have sat down week by week, this will indeed be a Barmecide's feast, or rather let me hope that when the covers are raised the dishes will not be found altogether empty. Perhaps the repast may be better likened to that which the physician set before his gouty patient surfeited with good things, who having been reduced to the extremity of hunger by a long fast, at length found himself seated at what appeared to be a plentiful repast, but beheld with dismay when the covers were raised that the principal dishes were biscuits, raisins, and cheese, good wholesome food indeed, but a great contrast to his former luxuries. So you have been surfeited these many weeks with the beauties of language and of style, the vigorous and clear exposition, of Lucretius, while I can only offer the dry details of a theory which, having been introduced into all the principal systems of the Universe, has now become a permanent feature in science.

Nothing can, as a rule, be more *malapropos* than an attempt to expound philosophy or science in the language of poetry. You cannot put the hard bullying facts of science into flowing rhyme. In poetry the imagination ought to wander fancy-led into regions the most unreal and visionary. Science weights the wings of the imagination, and drags it down to earth. It substitutes bare proven facts for aëry flights. The divine *afflatus* cannot

breathe graceful life into a hard law of science. We all exclaim with the poet:—

"When science from creation's face
Enchantment's veil withdraws,
What lovely visions yield their place
To cold material laws."—*Campbell.*

and again—

"Do not all charms fly
At the mere touch of cold philosophy?
There was an awful rainbow once in heaven:
We know her woof, her texture; she is given
In the dull catalogue of common things.
Philosophy will clip an angel's wings,
Conquer all mysteries by rule and line,
Empty the haunted air and gnomèd mine."

Keats.—*Lamia.*

Lucretius himself, early in his poem, declares that his intention is to divest actions attributed to the gods of their superstitious aspect, and to account for them by simple natural causes. The charming old myths were to be robbed of their poetry, and a materialistic explanation was to take their place:—"A man of Greece," he says, "was the first that dared to raise mortal eyes against religion, and first to make a stand against her. Him neither tales of gods, nor thunderbolts, nor heaven itself with its threatening roar, repressed, but roused the more active energy of his soul, so that he showed desire to be the first to break the close bars of nature's portals."

Many years before this there had been a popular demonstration in the streets of Athens because the thunderbolts of Zeus were referred to the common fire produced by the collision of clouds. Lucretius does not leave us in any doubt as to his intention. His object from first to last is to substitute 'cold material laws' for the works of the gods. "Wilt thou too," he exclaims, "overcome by the frightful tales of Poets, ever seek to turn away from me?"

In attempting to expound philosophy and science in a poem Lucretius has set an example which has not been often followed from the very unsuitability of the method. At this moment I can think of but two instances in which poetry has lent itself to the interpretation of science:—the one in the case of the *Tractatus de Sphœra* of George Buchanan; the other in that of a poem by an early Italian physician, setting forth in many hundred lines of (it is said) not inelegant Latin, the nature of one human disease.

Lucretius however is more a poet than a philosopher. Although hampered by dry details of facts, incapable of much poetic colouring, he brings

his subject into a bold and striking relief, and places it before the mind with great power of description, and with as forcible an imagery as the subject will permit.

For another reason, Lucretius will be remembered rather as a poet than as a philosopher—his philosophy is not original. There is not one original idea in all Lucretius, and in most things he simply repeats ideas which were originated three centuries earlier. There never was an original system of philosophy among the Romans; they borrowed everything from the Greeks. It was thus says Ferdinand Hoefer "que la Grèce conquit Rome." Lucretius fully admits the novelty of his subject as far as the Romans were concerned. "Nor does it escape my consideration" he writes, "that it is difficult to explain in Latin verse the profound discoveries of the Greeks, especially since we must treat of much in novel words, on account of the poverty of our language, and the novelty of the subjects."

Let us see to what extent there is anything original in the Atomic Theory, as expressed by Lucretius.

Mr. Colebrook in some very interesting essays "on the Philosophy of the Hindus" (published in the *Transactions of the Asiatic Society*), has pointed out that an Atomic Theory existed among the Hindus so early as 800 B.C. Kanàda the founder of the Nyaya system of Hindu philosophy, maintained that all material substances exist primarily as atoms, secondarily as aggregates of atoms. Atoms are eternal, aggregates are transient. Atoms are invisible, and simple. The particles of dust in a sunbeam which are the most minute of visible things are made up of several atoms. The first compound consists of two atoms; and the utmost sub-division of compound substances pursued to the last degree brings us to the atom, which is simple. When atoms are separated dissolution of the world takes place; at its renovation the atoms come together again to form air, then fire, then water, afterwards earth; then the body and its organs, ultimately the whole world.

Pure philosophy flourished in India long before the rise of Greek philosophy, and we must not be surprised at finding an atomic theory in that country at so early a date. Some of the Hindu philosophers anticipated Berkeley and argued against the existence of a material world; a theory which has been revived again in our time by Faraday, who reduces all matter to "centres of force," or at least suggests the possibility of such a thing.

In somewhat later Hindu philosophy we find not only the idea of the atom but also of an attractive force associated with it. The following extract exemplifying this, is given by Sir William Jones, from the poem of "Shi'ri'n and Ferhád, or the Divine Spirit, and a human soul disinterestedly pious":—
"There is a strong propensity which animates every atom, and attracts the minutest particle to some particular object. Search this Universe from its

base to its summit, from fire to air, from water to earth, from all below the moon, to all above the celestial spheres, and thou wilt not find a corpuscle destitute of that natural attractibility. The very point of the first thread in this apparently tangled skein is no other than such a principle of attraction, and all principles beside are void of a real basis. From such a propensity arises every motion perceived in heavenly or in terrestrial bodies; it is a disposition to be attracted which taught hard steel to rush from its place and rivet itself on the magnet; it is the same disposition which impels the light straw to attach itself firmly to the amber; it is this quality which gives every substance in Nature and tendency towards another, and an inclination forcibly directed to a determinate point."

Putting aside (for want of sufficient evidence) the claims of Moschus, the Phenician, to have been the founder of an atomic theory in pre-Homeric times; and omitting from our list the Pythagoreans, (whose *monads* if they were corpuscular, were indeed no more nor less than atoms,) we come to Leukippos the founder of the Atomic Theory of the Greeks. Posidonius the Stoic ascribes the theory to Moschus. Cicero in one place calls Demokritos the author of the atomic theory, and in another place Leukippos, but he affirms that the former extended the views of the latter.

No work of Leukippos has come to us, but his tenets have been passed down by succeeding philosophers, they are in the main as follows:—

Atoms are the principles of all things, the Universe is infinite, and is partly a *plenum* and partly *vacuum*; the world is formed by atoms falling into the vacuum, and becoming entangled the one with the other. Out of the infinite a vast number of atoms of all shapes and sizes was carried into the vacuum; these atoms struck against each other, and rolled over each other, and became endowed with gyratory motion, which led to a separation of such nature that similar atoms came together, and thus was the world formed.

Demokritos was a pupil of Leukippos and not only adopted but extended his theory; he is also said to have studied under Anaxagoras. He travelled in Egypt and Chaldæa, some say in India, and it is possible that the atomic theory as developed by him may have been derived more or less completely from those countries. He wrote largely on various physical subjects and on atoms. The following are some of his principle tenets:—

The Principles of all things are atoms and a vacuum: the one solid and full, the other empty. Atoms are infinite in number; the vacuum is infinite in extent. Atoms possess figure and magnitude: as to their figure it is infinite in variety; angular, globular, square, pointed, hooked, crooked. As to their magnitude they are invisible by reason of their smallness; indivisible by reason of their solidity; impassible and unalterable.

According to Plutarch, Epicurus added weight to the atoms of Demokritos, but Aristotle affirms that Demokritos believed one atom to be heavier than another according as it was larger than the other. Atoms have no other qualities, neither heat nor cold, nor colour, nor taste. Atoms are void of qualities.

The atoms are in perpetual motion in the vacuum which is infinite in extent. The motion existed from all eternity. The motion is oblique according to Demokritos, but according to Epicurus atoms have a two-fold motion, direct, and oblique. The atoms being carried into this void space, collide, rebound, separate from each other, or associate with each other by entanglements and out of these various actions all things are formed.

The rapid motion of the atoms is caused by a "*necessity*." Stobæus in a quite unintelligible sentence says; "This necessity is fate, and justice, and the providence which made the world, which is no other than the resistance and percussion of matter."

Just as a tragedy and comedy are made up of the same letters, so are all things made up of the same atoms differently arranged.

Epicurus says the universe consists of *body* and *vacuum*, and we cannot conceive any third nature.

The vacuum can neither suffer nor act, but can only afford a free motion to bodies passing through it.

Bodies we can see and feel, and that vacuum must also exist is evident, otherwise bodies would neither have any place in which to be, nor any place in which to move.

If all were full, all things must be immoveable, for no one thing could move without pushing forward all other things, and without the vacuum no place would remain into which things could be thrust.

Apropos of this Lucretius brings forward his argument of the fish (I. line 372). Some say that water yields to fishes pushing forward in it, while it closes so soon as they pass into the forward place, and the plenum is undisturbed. But they do not recognise the fact that the first impulsion forward of the fish could not take place, if space were everywhere full because there would be no place either before or behind into which the water could be moved. We must therefore assume that there are little spaces in all things, especially in fluids into which particles driven forward may be received:—"We must deny motion to all bodies whatsoever, or we must admit that vacuity is more or less inherent in all material substances, whence everything that moves derives the first commencement of its motion." The fallacy of this reasoning from the standpoint of modern science is sufficiently obvious. The argument is to prove that matter is not absolutely continuous, and by vacuum Lucretius here evidently means the spaces between the atoms

of bodies. If he applies the same argument to solids, liquids, and gases, and and assumes an equal continuity of matter in each to constitute a plenum, he is right in assuming that all motion of every kind would be impossible, and the argument of the fish becomes more intelligible.

The universe is infinite and has no boundary; it contains all space, and has no extremity. Let us imagine an extremity, and suppose a man to be placed there who forcibly throws a dart towards its surface, then the dart will either go forward, or will remain motionless. Now it is obvious that if it goes forward there is a place beyond, and the extremity is not there; while if it remains motionless there is a something beyond which hinders the motion: thus in either case we have not attained the actual extremity.

"The largest atom is not visible to the sight": thus the atomists recognised differences of size in their atoms. But although beyond the sense of sight, it has a certain magnitude; the larger order of magnitudes are alone excluded from it. The fact of its invisibility does not do away with its existence, for wind, heat, cold, and sound are equally invisible but they have a real existence. Moreover we cannot see the particles of moisture which make linen damp, or the particles worn from a plough share, or a stone hollowed by dropping water, or the particles by which plants and animals grow. In the motes in a sunbeam there are thousands of atoms.

As to the shape of atoms there are not so many differences in the shapes of concrete things as in those of the atoms which compose them; they are round, oval, lenticular, flat, gibbous, oblong, conical, hooked, smooth, rough, bristly, quadrilateral, &c., both regular and irregular. There is an infinite number of each kind of shape of atom. Although of irregular shapes we must not conceive that atoms have ever been broken or worn away, they are infinitely hard.

Atoms gravitate. They are perpetually moving or striving to move, and the motion is conferred by the external impulse of gravity. Atoms have a twofold motion, one due to gravity, that is their own weight; the other due to percussion and reflection; for when two atoms collide they rebound from each other. If atoms always moved straight downwards with the same velocity they would never collide hence we must assume that they are moved a little aside, whence follow frequent collisions. The "agitation or inward palpitation" of the atoms of which Lucretius speaks would seem to correspond more or less to what we call *vibration*, that is a backward and forward motion of atoms among themselves. The motion of atoms is infinitely swift; they pass through all imaginable space in a moment:—presumably if they do not often collide.

Atoms are the principles and first matter of all things. By an "inconsiderate and casual motion" they rushed in multitudes into the place where the world

now is; then they fastened upon one another and presently produced a great heap, in which great atoms were mingled with small, smooth with rough, round with square. Then the heaviest began to settle down, and the smaller lighter atoms were consequently extruded and carried upwards. These various motions led to a good deal of repercussion and reverberation, and by this means heaven was generated. Certain atoms of the same nature which were pushed upwards formed the sun, moon, and stars; those which settled down formed the earth. The minuter creation of the parts of the earth, the animal, vegetable, and mineral kingdoms is so incomprehensible that I forbear to quote it. When primary atoms are in close continuity hard solids such as metals and stones are produced, when they are far apart, liquids and vapours. Atoms alone are immutable and eternal. The various forms of matter in the world compounded of these elementary atoms, undergo perpetual decomposition and change; they split up into their original atoms, and these again form new compounds. The world itself is a compound, and is fed by the streams of atoms floating through the infinity of space; hence it also must one day perish, and new worlds will rise upon its ruins.

Such in brief is the atomic theory as set forth by Lucretius. It had long pervaded earlier Greek philosophy; we value it in the poem of Lucretius because we there find it in a continuous and complete form, expressed in a most vigorous and fervid manner. A great cosmic theory permits itself to be expounded by the poet far better than the details of any one particular scheme or science. There is more scope for the imagination in dealing with universals than in dealing with particulars. The chief merit of Lucretius lays in his complete expression of the theory as it then existed, in bold earnest language, rather than in any originality. The latter he had not; yet he takes much credit to himself for his work, and must surely have been the most conceited of men. "Nor does it escape my knowledge," says he (I—l. 922), "how obscure these matters are; but the great hope of praise has struck my heart with her powerful thyrsus, and has at the same time infused into my breast a pleasing love of the Muses, with which inspired I now wander, in vigorous thought, over the trackless regions of the Pierides, trodden before by the foot of no poet. It delights me to approach the untasted fountains, and to drink, and it transports me to pluck the fresh flowers, and to obtain a distinguished chaplet for my head from those groves whence the Muses have hitherto veiled the temples of no one. In the first place because I give instructions concerning mighty subjects, and proceed to free the mind from the closely-confining shackles of religion; in the next place, because I compose such lucid verses concerning so obscure a subject, touching everything with the grace of poetry."

Prof. Veitch, of Glasgow, in his recently published essay on Lucretius (1875), asserts that the *De Natura Rerum* "is the one poem of antiquity that has for its distinctive subject the phenomena of nature; and it is the one classical poem which shows a greater direct interest in outward nature than in human feeling or action." This is not to be wondered at when we remember how far more completely studies of human character and action, lend themselves to poetic treatment than the phenomena of nature. The same author goes on to make the somewhat bold assertion that "there is no one in the whole series of ancient Roman writers, in poetry or prose, who can be placed alongside of Lucretius, for the union of high speculative power, deep moral earnestness, and imagination that rises to the loftiest reaches of awe and grandeur." However this may be, there can be no doubt, we think, that a finely described dramatic incident in the career of one human life may surpass in interest the grandest description of nature. There is nothing in Lucretius that impresses us so much as some of the more dramatic incidents described in the *Eneid*; and it will surely be confessed that if the verses of Virgil are less powerful than those of Lucretius, they are less rough, and more finished and artistic.

For Lucretius has been claimed a great breadth of conception; his ideas of time, and space, and infinity, are said to be full and daringly speculative; but surely his remarks on the "infinite," and on a boundless space," do not much assist the mind, to realise what they are; and the description of a descent into Hades, by a better poet and worse philosopher will more powerfully affect us. And *apropos* of Prof. Veitches' remark concerning the "imagination that rises to the loftiest reaches of awe and grandeur," I ask the most fervent admirer of Lucretius whether, from this point of view alone, of course fully recognising that the stand-point is different, there is anything in all the *De Natura Rerum* that is one half as sublime and awe-inspiring, one half as powerfully treated as the conclusion of the *Edipus at Colonos*, is that fine passage in which the old man, having been summoned by thunder to the to the shades below, leads the way to his last home:—

"Hither, by this way come, for this way leads
The unseen conductor of the dead, and she
Whom shadows call their Queen. O light, sweet light
Rayless to me, mine once, and even now
I feel thee palpable, round this worn form
Clinging in last embrace: I go to shroud
The waning life in the eternal Hades."

(*Lord Lytton's translation*).

Then when Edipus has led the way to a cavern, and performed libations from a stream, and put on his funeral robes, a bodiless voice calls from the earth "Ho! Edipus come hither come":—

" But how the old man perished, save the king,
Mortal can ne'er divine; for bolt, nor levin,
Nor blasting tempest from the ocean borne,
Was heard or seen; but either was he rapt
Aloft by wings divine, or else the shades,
Whose darkness never looked upon the sun,
Yawned in grim mercy, and the rent abyss
Engulf'd the wanderer from the nether world."

(*Lord Lytton's translation*).

And thus the great catastrophe is magnificiently brought to a climax.

Here is a passage from Lucretius which Prof. Veitch (an able scholar, and himself a poet translated, and which he considers "one of the most powerful and characteristic in the poem." (B.K.V. l. 364 *et seq*).

" The world is not a solid unity,
Imperishable; there is void in things;
But not mere void; and bodies fail not that
Perchance may rise out of infinity,
And in strong sweep of eddying whirl o'erthrow
The sum of things, or down upon it clash
Some other perilous disaster dire;
Nor does there fail the space of deep profound,
Wherein to broad-cast ruin down may sink
The world's walls: they by other force assailed
May perish. Think not then the gate of death
Is closed against the heavens, the sun, or earth,
Or deep flow of the sea; it aye with vast
Wide open gape, stands waiting for the world
If things may die, they also had a birth,
For mortal frame was ne'er compact enough
To spurn back through infinite time till now
The powerful strain of ages limitless."

Lucretius did much to propagate the atomic theory of Epicurus and the earlier Greeks, both by collecting together the views of his predecessors, and by putting them into vigorous verse. We must remember moreover that mere fragments of the writings of the earlier atomists remain to us, so that the *De Natura Rerum* has conserved for us a mass of ancient learning.

During the Middle Ages the atomic theory was adopted in a more or less complete form, in the few philosophical systems (all of very minor importance which arose during that period. One of the fathers of modern philosophy Descartes (1596—1650) devised and adopted a modified atomic philosophy. The physical philosophy of Descartes is founded on the hypothesis that all

matter originally consisted of square particles, upon which at the creation of the world two motions were conferred, the one causing them to rotate about their own axes, the other causing groups of particles to revolve about a common centre. During their revolution the square particles gradually had their angles wore down by the constant friction, and thus three elements or first principles were produced. The *first element* is the dust produced by the abrasion of the angles:—Of this the sun, moon, and stars are composed. The *second element* consists of the spheres which remain when the original square particles have had all their corners worn off perfectly smooth:—of this the atmosphere and all the matter between the earth and the stars are composed. The *third element* consists of particles which are neither round nor square, but which are partly worn smooth, and partly have their angles remaining:—of this the earth and all terrestrial bodies are composed.

Lord Bacon and John Locke frequently refer to the small particles of which matter is made up. The former defines heat as "not an uniform expansive motion of the whole, but of the *small parts* of bodies;" again he says "heat is a motion, expansive, restrained, and acting in its strife upon the smaller particles of bodies." John Locke affirms that heat "is a very brisk agitation of the insensible parts of the object."

In fact during and after the seventeenth century it was very fully recognised that natural phenomena take place through the intervention of the minute particles of matter, rather than through that of sensible masses; and this most important fact is recognised more and more fully every day.

The *Monads* of Leibnitz (1646—1716) are derived from and not dissimilar to the atoms of the Greek philosophers. They are individual unities, indestructible by any external force. Schwegler calls these monads "metaphysicial points." The universe is the sum of the monads. Everything is an aggregate of monads.

Neither Leibnitz nor Descartes admitted the full definition of the atom as given by the Greek philosophers. The Cartesians tried to prove that no body can be really considered incapable of division; Leibnitz asserted that no body can be absolutely hard; for if two absolutely hard, and consequently inelastic bodies, were to collide they would stop at once if they possessed equal and opposite motions. Cardinal Polignac, in his *anti-Lucretius*, adopts similar arguments.

The Abbé Boscovich added the new idea of repulsion to the atomic theories of his predecessors. According to him matter is made up of an infinite number of unextended indivisible points, which never touch each other on account of a mutual repulsion which exists between them; and this repulsion increases with the nearness of the atoms until at length it becomes so powerful that no force can overcome it.

Newton has very clearly expressed his ideas as to the constitution of matter:—"All things considered," he says, "it seems probable, that God in the beginning, formed matter in solid, massy, hard, impenetrable, moveable particles, of such sizes, figures, and with such other properties, and in such proportion to space, as most conduced to the end from which he formed them; and that these primitive particles, being solids, are incomparably harder than any porous body composed of them; even so very hard as never to wear or break to pieces; no ordinary power being able to divide what God himself made one in the first creation."

In 1808 John Dalton, of Manchester, published his *new system of chemical philosophy*. This system was founded upon the application of the Greek atomic theory to the explanation of chemical phenomena. It had been proved by Wenzel and Richter that bodies combine chemically in certain definite proportions. Dalton assumed:—

a. That the ultimate particles of all simple bodies are atoms incapable of further division.

b. That these atoms are all spheres.

c. That each atom possesses a certain particular weight; the same for all atoms of any one substance, and different for atoms of different substances. Thus taking the atom of the lightest substance (hydrogen) as the unit, the atom of oxygen will be represented in weight by the number 7, carbon by 5, and nitrogen by 5.

d. These are the *relative weights*, or *atomic weights* of bodies.

e. When bodies combine chemically, the atoms unite to form binary compounds as water H + O or 1 + 7 = 8, the weight of the smallest mass of the compound being the aggregate of that of its atoms.

f. The atomic weights of all bodies are multiples of that of hydrogen.

Sir Humphrey Davy preferred to substitute the word *proportion* for Dalton's word *atom*, while Dr. Wollaston preferred the word *equivalent*.

From Dalton's researches arose three important laws which form the basis of modern chemistry; these are:

1. The law of *definite* proportions.
2. The laws of *multiple* proportions.
3. The law of *atomic* or *equivalent* proportions.

The law of definite proportions asserts that the nature and proportions of the constitutent elements in every chemical compound are definite and invariable. For example chalk or carbonate of lime in whatever crystalline or other form it may exist, and wherever it may be found, contains in every 100 parts, 56 parts of lime, and 44 of carbonic acid.

The law of multiple proportions asserts that when one element, say oxygen, unites with another, say nitrogen, in more proportions than one, the quantity of O increases in multiples. Thus we have N_2O, N_2O_2, N_2O_3, N_2O_4, N_2O_5. Now if we assume the indivisibility of our atoms, it is quite clear why we have this kind of combination, for it is impossible to halve the atom, and if the atomic weight of oxygen be 16, we must add on successive relative weights of 16 of oxygen in passing from one of the above compounds to another. Thus we have

$N_2O = 28 + 16$
$N_2O_2 = 28 + 32$ or (16×2)
$N_2O_3 = 28 + 48$ or (16×3)
$N_2O_4 = 28 + 64$ or (16×4)
$N_2O_5 = 28 + 80$ or (16×5)

The law of atomic or equivalent proportions asserts that every element when it combines with other elements or displaces other elements from combination, does so in a fixed proportion, capable of numerical statement.

Thus if the atomic weights of silver = 108, of sodium 23, of potassium 39, and of chlorine 35·5, it is found that if 108 of silver require 35·5 of chlorine to form chloride of silver the one atom of chloride will require 23 parts by weight of sodium, and 39 of potassium to form the respective chlorides of these bodies. Or let us take a case of double decomposition; a solution of nitrate of silver $Ag\,NO_3$ (Ag = 108, NO_3 = [14 + 16 3] 62), is added to a solution of chloride of sodium (Na = 23, Cl = 35·5).

Ag (108) ⟍⟋ Na (23) = $Na\,NO_3$ = 62 + 23 = 85
NO_3 (62) ⟋⟍ Cl (35·5) = Ag Cl = 108 + 35·5 = 143·5

Some curious observations have been made as to the divisibility of matter:—Gold has been beaten into leaf so fine that it would take a pile of 282000 of such leaves to extend to a height of one inch. In the fine wire used for gold embroidery, it is possible under a microscope to see the 432,000,000,000 part of an ounce. Again in a small drop of blood such as would remain on the point of a needle; there are, in the case of human blood, 3,000,000 corpuscles, and in the case of the blood of the musk deer 120,000,000. Mr. Tomlinson has made a curious calculation based on the quantity of soap in a soap bubble, which latter, by optical means, may be proved to be of less thickness than one 2,600,000 of an inch. "Pure water will not hold together in this way, but the admixture of less than the hundredth of its bulk of soap will confer this property on the whole of the water. Now, in order to produce this effect, it is evident there must be a portion of soap (at least *one* atom) in every cubic 2,600,000th of an inch of the solution. Therefore a single atom of soap in the solid state cannot

possibly occupy as much as the hundredth of a cubic 2,600,000 of an inch, that is not so much as a 1757 trillionth (1,757,000,000,000,000,000,000) of a cubic inch." Mr. Tomlinson seems to have lost sight of the fact that soap is a very complex body from a chemical point of view, and the smallest possible quantity which can exist contains several dozens of atoms, so that our ultimate atom is driven yet farther back in the scale of the infinitely minute.

A few years ago Sir William Thomson gave an interesting calculation in *Nature*, relating to the size of atoms. His calculation led to the following result: that if a drop of water were increased in magnitude until it became as large as the world, and if every atom in it were increased in like proportion, the size of the atoms would be between that of a small shot and a cricket-ball. Other calculations have confirmed this, and it is now usual in order to give some idea of the minuteness of atoms, to take a mean result, and say, that if a drop of water were magnified until it became as large as the world, the atoms composing it would be about the size of small oranges. But water is a compound body. Hence strictly we cannot speak of the *atom* of water, for atom by the etymology is that which cannot be divided, while the smallest quantity of water which can exist as water can at least be divided into an atom of oxegen and two atoms of hydrogen; hence we must use some other word than atom in speaking of the smallest quantity of any compound body. The word which is used for such a purpose is *Molecule*, a low Latin diminutive *Molecula*, from *Moles* a mass. Prof. Veitch has well defined the Molecule of a body as "the least part that is homogeneous with the whole." Hence our single Molecule of water after having been magnified to an extent represented by increasing the diameter of a sphere from one-quarter of an inch to 8000 miles, would only be as big as a small orange!

Of recent literature relating to Atoms and Molecules I may mention Prof. Clifford's lecture on *Atoms* (Nov. 1872) and Prof. Clerk Maxwell's lecture on *Molecules* (Sept. 1873). Our ideas concerning atoms and molecules have of late years received considerably additions from a study of the effects of heat on gases under various conditions of pressure and temperature. Indeed we believe heat to be the vibratory motion of the molecules of bodies. Prof. Clifford tells us that, "an atom is something that is capable of vibrating at certain definite rates; also it is capable of other motions of its parts besides those vibrations at certain definite rates; and it is capable of spinning round about any axis.....The number of them in this room is so great that it strains the powers of our numerical system to count them. They are flying about in all directions, and mostly in straight lines, except where they get quite near to one another, and then they rebound and fly off in other directions."

Prof. Clerk Maxwell commences his lecture on Molecules thus, "An atom is a body which cannot be cut in two. A molecule is the smallest possible portion of a particular substance. No one has ever seen or handled a single molecule." This high authority adopts the atomic theory of Demokritos, Epicurus, and Lucretius, in its literal sense; *i.e.*, he believes that matter is not infinitely divisible, that you arrive at some *least*, some point where division ends.

The pressure of a gas on the sides of the vessel which contains it, is due to the impact of its molecules,—and the pressure on the sides of any vessel is therefore dependent on the number of molecules, in other words to the quantity of gas within the vessel. If the velocity of the molecules be increased, that is if heat be communicated to the gas, the impulse of each molecular impact will be increased in the same proportion, and the molecules will also strike the sides of the vessel a greater number of times in a second, so that the pressure will increase as the *square* of the velocity. A given volume of every gas at the same temperature and pressure contains the same number of molecules. The velocity of the molecules of air and the ordinary temperature has been calculated to be *about seventeen miles in a minute*. The molecules of gases flying about in all directions frequently come into collision, and when this takes place the path of each molecule is charged, and they move off in new directions. The rapidity of these molecular movements may be illustrated by taking the stopper out of a bottle of ammonia or some other substance easily recognised by its smell. Then in the course of a few minutes the gas may be recognised in a distant part of a large room, and if it were not for the frequent collisions, the molecules would travel from one end of the room to the other in far less than a second. Prof. Maxwell says that "if we wish to form a mental representation of what is going on among the molecules in calm air, we cannot do better than observe a swarm of bees, when every individual bee is flying furiously, first in one direction, and then in another, while the swarm as a whole, either remains at rest or sails slowly through the air." Lucretius gives another illustration to explain the same idea: "He employs the image of a flock of sheep with skipping lambs, which seen from a distance, presents simply a white patch upon the green hill, the jumping of the individual lambs being quite invisible."

The size of the molecules of hydrogen is such that about 2000,000 of them placed side by side which form a length of one twenty-fifth of an inch, while 1,000,000,000,000,000,000,000,000 of them would weigh between four and five grammes (1 gramme = 15·43 grains).

The Greek idea that the atom is infinitely hard, is not accepted in the modern molecular theory; although the molecule is indestructible it is not a hard rigid body, but it is capable of performing internal movements, and

when these take place the molecule emits rays in the form of undulatory movements of the ether, the wave-length of which measures the time of the vibration of the molecule. Now since wave-lengths even of the most distant stars can be measured with extreme accuracy, we have been able to ascertain that the hydrogen in certain almost infinitely distant nebulæ has the same vibration-rate as the hydrogen that we make in our laboratories.

These are the most modern ideas concerning the atom and the molecule. It will be seen that we have retained some of the old Greek notions, while the rigid application of the higher mathematics has compelled us to discard others. One thing is sufficiently obvious, viz., that an atomic theory in some form or other is inseparable from Physical Philosophy. We cannot account for the phenomena of Nature, without admitting the existence of atoms. The most stupendous effects in nature are produced entirely through the intervention of atomic movements. Moreover we are year by year reducing our Physical Forces, which for centuries have had such unsatisfactory names as "imponderable agents," "subtle fluids," "invisible effluxions," to movements of the molecules of matter.

Those who desire to pursue this subject more fully will find the following works useful.

Lucretius *De Natura Rerum*.
Stanley History of Philosophy, 1701.
Schewegler's History of Philosophy, 1867.
Dr. Daubeny's History of the Atomic Theory, 1831.
Prof. Veitch's "Lucretius and the Atomic Theory," 1875.
Prof. Clifford "On Atoms."
Prof. Clerk Maxwell "On Molecules."
Sir William Thompson "On the Size of Atoms." *Nature*.

MIDSUMMER TERM, 1877.

PRELIMINARY MEETING, HELD MAY 4TH, 1877.

The following arrangements were made:—

General Meetings, Thursday, May 17; June 7, 21; July 5.

Field Days, May 19; June 30.

It was also decided to have an "Exhibition Meeting" on May 10, and Members were requested to bring objects for exhibition.

EXHIBITION MEETING, MAY 10TH, 1877.

This was an experiment to see how far Members could manage to bring objects for Exhibition, and also to give an opportunity of displaying Donations to the Society. As regards the first object, but very little was done. G. R. Rogers exhibited 3 Kestrel's Eggs taken by himself that day; A. C. D. Pigott exhibited some fossils from the Coal Strata; and the President a species of fresh water Conferva, under the microscope.

Several "notices" of birds and insects were recorded, and the following donations were also exhibited, and thanks ordered to be given to the donors.

BOOKS.

A complete set of the Quarterly Journal of the Meteorological Society, by the Society.

Journal of a Naturalist and Broderib's Zoological Recreations, by Miss Alleyne.

Addresses &c., of the North Staffordshire Naturalist's Field Club, by Rev. T. W. Daltry.

Forms of Animal Life, by Professor Rolleston, F.R.S.

Discoveries and Inventions of XIX Century, by F. M. Lucas.

Tyndall on "Sound," by R. B. Dods.

Birth of Chemistry, by G. F. Rodwell, Esq.

Descriptive Catalogue of the Birds in the Dyke Road Museum, by Rev. T. A. Preston.

Smile's Life of a Scotch Naturalist, by ditto.

VARIOUS.

A specimen of "Candle Nut," by E. M. R. Cox.

Two coins of Sihtric, a King of Dublin, by Major Creeke.

Eggs of Crocodile and 2 Emu's Eggs from Australia, by H. M. Hamilton, Esq., O.M.

Egg of Jackdaw from a nest in a tree, by N. Manders.

2 Coins, by Mr. Perkins.

MEETING HELD MAY 17TH, 1877.

The President read a paper on Crocodiles and Alligators, after which the following exhibitions were made.

A Photograph of the Ancient Documents and other objects belonging to the Corporation of Marlborough, presented by R. W. Merriman, Esq.

An uncommon fungus (*Exidia glandulosa*) by J. C. Priestley.

A specimen of Bohemian wax-wing (*Bombycilla garrula*), presented by J. C. Priestley.

A large series of specimens of Gold Ore, &c., presented by F. Andrews, Esq.

There were 113 persons present, 3 Hon. Mems., 64 Members, and 46 Visitors.

FIELD-DAY, MAY 19TH, 1877.

In consequence of the great increase in the number of Members, the party was limited to 40. Mrs. Price, of Wolfhall, kindly allowed the use of the large Historical Barn, which is now almost a mass of props inside, as the whole structure is gradually sinking down sideways, not only from some of the supporting beams giving way, but also from the weight of the thatch, which is said to be as much as 6 feet thick in some places. Till the conclusion of dinner the rain came down very heavily at times, but the weather then cleared, and a very fair afternoon was spent by the Members. It was rather late in the year for the Ornithologists and the reverse for the Botanists, so that no very great results were obtained. One new species, only a "casual" however, *Lepidium Sativum*, was added to our list.

MEETING HELD JUNE 7TH, 1877.

F. E. Thompson, Esq., read an interesting paper on English Life in the time of Shakespeare.

A copy of the Reports of the United States, Geological and Geographical Survey, which had been received in exchange for a copy of the Society's Reports, was exhibited. There was no time for any further exhibitions.

There were 110 persons present, 7 hon. mems., 57 members, and 53 visitors, including Mrs. Bell and 6 other ladies.

MEETING HELD JUNE 21ST, 1877.

The President gave a lecture on the peculiarities in the structure of some of the common Orchids occurring near Marlborough.

Various experiments upon specimens which had been provided occupied the rest of the time.

There were 57 persons present. 2 hon. mem., 39 members, and 16 visitors.

FIELD DAY, JUNE 30TH, 1877.

A party of 40 started for Chilton Foliatt, and the weather being fairly fine, a very pleasant day was enjoyed. Except in the Botanical line, but little was done, it being rather too wet and dull for the Entomologists. Upwards of 250 species of plants were observed in flower, the most noticeab'e being the Bee Orchis (*O. apifera*) which seems unusually abundant this year, in common with the Fragrant Orchis (*G. conopsea*) and the Pyramidal Orchis (*O. pyramidalis.*)

MEETING HELD JULY 9TH, 1877.

This was deferred from July 5th, in consequence of the Cheltenham Match; and, from a misunderstanding, no Paper was ready. It was therefore only a private meeting, to explain the new arrangements about the Museum and to give members an opportunity of expressing their wishes.

There were 50 persons present. 2 hon. mem., and 48 members.

DONATIONS TO THE MUSEUM.

Books, &c.:—	
Complete set of the Quarterly Journal of the Meteorological Society	The Society.
Journal of a Naturalist	Miss Alleyne.
Broderib's Zoological Recreations	„
Addresses of the North Staffordshire Field Club ...	Rev. T. W. Daltry.
Forms of Animal Life	Prof. Rolleston, F.R.S.
Discoveries and Inventions of the XIX. Century	F. M. Lucas.
Tyndall on "Sound"	R. B. Dods.
Birth of Chemistry, by G. F. Rodwell, Esq. ...	The Author.
Catalogue of the Birds in the Dyke Road Museum	Rev. T. A. Preston.
Smiles' Life of a Scotch Naturalist	„
Reports of the U.S. Geological and Geographical Survey	American Government.
Zoological:—	
Specimen of Ocellated Frog (*Rana Ocellata*) probably from the Island of Dominica, West Indies	W. H. M. D'Urban.
7 specimens of Pearl-bearing Fresh-water Mussel (*Unio Margaritifera*), from the Teign, near Dunsford Bridge, South Devon	W. H. M. D'Urban.
2 specimens of Swan Mussel from the Exeter Canal	„
Various Shells, &c., from Africa	J. G. Crosse, Esq.
Egg of Crocodile from Australia	H. M. Hamilton, Esq.
Globe Fish	W. H. Nelson.
Hornet's Nest	R. F. Cholmeley.
Ornithological:—	
2 Eggs of Moorhen (Malformed)	E. M. R. Cox.
2 Emu's eggs from Australia	H. M. Hamilton, Esq.
Egg of Jackdaw, from a nest in a tree	N. Manders.
Specimen of Bohemian Waxwing	J. C. Priestley.
Botanical:—	
"Candle Nut," from Fiji	E. M. R. Cox.
Miscellaneous:	
Pemmican, from the late Arctic Expedition ...	C.E. Blackett-Ord, Esq.
Various objects from South Africa	J. G. Crosse, Esq.
Geological:—	
Series of specimens of Gold Ores, &c.	F. Andrews, Esq.

1. Flote Ore (*i.e.*) ore found on the ground, from some lode not yet discovered, containing copper and grey silver—silver and lead, near Breckenridge, Somerset County.
2. Fossil Wood.—Castello's Ranche, half-way between Colorado Springs and Fair Play, about a dozen trees very close together, from one single stump as it were, amongst a lot of other trees still growing.
3. Telluride.—Sulphur and Gold. *Very rich* in gold.
4. Gold from Central City, Gilpin Co.
5. Native silver, two specimens, from Goss Tunnel, Brownville, Colorado; and also specimen of Ruby Silver.
6. Carbonate of Copper and rich Silver Ore, Everett Mine, near George Town.
7. Seven specimens, showing first appearance of a lode.
8. Gold Ore from Empire Mine; from 2 to 8-oz. gold to a ton of ore.
9. Specimen from Pelican Mine, near George Town, Colorado. Largest mineral mine in the district.
10. Veins of Mineral with Native Silver on the face, from Baltimore (or Goss) Tunnel.
11. Carb. of Copper from Mastodon Mine.
12. Fine grained lead Ore from Birley Tunnel.
13. Three specimens from Mendota Lode above it, probably the same vein as No. 12.
14. Four Gold Ores—Gilpin County to show combinations of samples.
15. Specimen from Gilpin County to show peculiarities of formation.

Madrepore ... ... T. N. Fox.

Archæological:—

2 Coins of Sihtric, a King of Dublin ... ... Major Creeke.
2 Roman Coins ... ... Mr. Perkins.
Photo. of Marlborough Antiquities ... ... R. W. Merriman, Esq.
Groat of Henry VIII. (2nd issue) ... ... Mr. Chivers.

ORNITHOLOGICAL NOTICES.

The following List of Notices is compiled from separate Lists kept by N. Masterman, Esq., and T. G. Balfour, as well as occasional notices reported to me, the accuracy of which must depend on those who gave me the notices, though I believe them to be correct in every case. The dates of first oviposition have been lost in some cases, owing to absence from Marlborough during the holidays, but on the other hand there are some remarkably late dates recorded, and the List will therefore prove as interesting to those who care about these things as any previous one.

It may also be mentioned, that, though several notices of the same kind of eggs have been recorded, it does not at all prove that they have been all taken—the record alone of the notice being made.

A Rook with white feathers in its wings was seen on March 1st, by *E.S.M.*, and on March 3rd, by *T.G.B.*

A pure white Swallow was shot in September, 1876, and is now in the possession of *Mr. Hamblin*, of the Marquis of Ailesbury's Arms, Bath Road.

A Hoopoe was shot in the Forest, on April 30th, by *Mr. Ponting*.

Large flocks of Gulls were seen flying to S.W. over Savernake Forest on December 31st, 1876, by *Mr. Green*.

The egg of the Whitethroat, taken on May 24th, by *H.H.F.*, was a remarkably small one, and is conjecturally assigned to this species.

The "Common Curlew," seen by F. H. Furnival, on April 5th, 1876, was the Stone Curlew, (erratum in last Report.)

NAMES OF OBSERVERS.

E.A.	E. Acton.
T.G.B.	T. G. Balfour.
E.B.	E. Brunton.
C.S.B.	C. S. Browning.
A.J.B.	A. J. Burgess.
W.O.C.	W. O. Charlton.
E.M.B.C.... ...	E. M. B. Cox.
W.F.C.	W. F. Crowe.
A.H.D.	A. H. Davis.
W.D.	W. Dawson.
R.B.D.	R. B. Dods.
W.H.M.D. ...	W. H. M. D'Urban.
P.H.E.	P. H. Eliot.
T.S.E.	T. S. Ewart.
E.F.	E. Feetham.
H.H.F.	H. H. Finch.

W.A.F.	... ...	W. A. Fox.
F.H.F.	... ...	F. H. Furnival
G.N.G.	... ...	G. N. Going.
J.J.H.	... ...	J. J. Hammond.
C.H.	... ...	C. Hastings.
J.G.H.	... ...	J. G. Henniker.
C.A.H.	... ...	C. A. Hoffman.
H.R.H.	... ...	H. R. Hordern.
C.W.B.J.	... ...	C. W. B. Jones.
T.L.K.	... ...	T. L. Kesteven.
W.E.L.	... ...	W. E. Lascelles.
N.M.	... ...	N. Manders.
E.S.M.	... ...	E. S. Marshall.
E.M.	... ...	E. Meyrick.
A.S.M.	... ...	A. S. Morris.
W.H.N.	... ...	W. H. Nelson.
F.W.N.	... ...	F. W. Nott.
R.H.B.P.	... ...	R. H. B. Parnall.
A.C.D.P.	... ...	A. C. D. Pigott.
L.J.R.	... ...	L. J. Richardson.
G.R.R.	... ...	G. R. Rogers.
B.C.S.	... ...	B. C. Sharp.
H.S.S.	... ...	H. S. Smith.
F.S.	... ...	F. Street.
C.H.V.	... ...	C. H. Villiers.
E.G.W.	... ...	E. G. Waddilove.
A.L.W.	... ...	A. L. Wright.
H.F.W.	... ...	H. F. Wright.
L.Y.	... ...	L. Youngs.

Kestrel—4 eggs, May 8, T.G.B.: 4, May 10, A.L.W.; 3, May 10, G.R.R. and H.R.H.; young, May 25th, T.G.B.

Sparrow Hawk—4, May 10, H.F.W.; eggs, May 10, H.R.H; 2, May 17, T.L.K.; eggs, May 29, W.E.L.; 3, June 3, H.R.H.; 2, June 24, H.R.H.

Long-eared Owl—1, Mch. 10, H.R.H.; 3, Mch. 10, F.H.F., T.L.K.; H.R.H.; 1, May 19, L.Y.

White Owl—2, May 2, F.H.F.; 4, May 3, F.H.F.; 2, May 17, H.R.H., H.F.W.

Tawny Owl—2, Mch. 10, F.H.F., J.G.H.

Red-backed Shrike—2, May 15, P.H.E.; 2, June 5, T.G.B.

Spotted Flycatcher—1, June 9, E.S.M.

Misel Thrush—Young fledged, Ap. 28, T.G.B.; 3 eggs, May 6, T.L.K.

Song Thrush—2, Mch. 24, F.H.F., 4, Mch. 25, E.F., L.J.R.; young flying, Ap. 30, T.G.B. and E.S.M.

Blackbird—young flying, May 25, T.G.B.

Hedge Accentor—4, May 17, F.W.N.

Redbreast—4, May 26, F.W.N.; young flying, May 27, T.G.B., E.S.M.

Redstart—Seen, May 1, N.M.

Stonechat—Common, Feb. 17, E.S M.; young flying, May 25, E.S.M.

Wheatear—5, May 17, H.R.H., H.F.W.; 8 eggs, May 17, A.L.W.

Grasshopper Warbler—seen, May 1, T.G.B.

Reed Warbler—4, June 18, J.J.H.

Nightingale—Ap. 24 (Ramsbury), E.M.

Blackcap—Seen, Ap. 10, N.M.; 3, May 22, C.A.H.; 4, May 26, F.W.N.

Garden Warbler—6 caught Ap. 19, *Mr. Coleman*; 4, 5, May 27, T.G.B.; E.S.M.

Whitethroat—Song May 4, T.G.B.; 2 nests Ap. 30, G.R.R.; 1 May 18, T.G.B., E.S.M.; 2 May 18, T.L.K.; 1 May 24, H.H.F.

Lesser Whitethroat—Song May 5, T.G.B.; 1 July 19, C.H.

Willow Warbler—6 May 25, G.R.R., E.G.W.

Golden-crested Regulus—10 May 26, E.A.

Marsh Tit—4 May 30, F.W.N.

Long-tailed Tit—Eggs May 22, *N. Masterman, Esq.*; 8 May 22, W.H.M.D., R.H.B.P.

Pied Wagtail—1 Ap. 30, G.R.R.; 3 May 12, F.W.N., E.B.; 5 July 19, C.H.

Yellow Wagtail—seen May 10, C.S.B.

Skylark—3 May 12, L.Y.; eggs May 18, T.G.B.; 4 May 27, B.C.S.; 3 June 2, H.R.H.

Bunting—4 eggs near hatching, *N. Masterman, Esq.*

Yellow Bunting—building May 25, T.G.B.; 2, 3, July 19, C.H.

Chaffinch—2 May 27, T.G.B., E.S.M.

Mountain Finch—common on Rookley Downs, Jan. 25, *Mr. Green.*

House Sparrow—7 (in one nest) May 17, F.W.N.

Greenfinch—nest finished May 6, T.G.B.; 2 May 14, T.G.B.

Hawfinch—seen on the Mount Sep. 21, 1876, E.S.M.

Goldfinch—5 June 10, F.S.

Linnet—3 May 6, H.R.H.; 2 May 8, E.S.M.; 1 May 15, T.L.K.; young May 20, *N. Masterman, Esq.*; young flying May 21, W.D.

Starling—4 May 6, W.O.C, W.F.C.; young flying May 27, T.G.B., E.S.M.

Carrion Crow—sitting May 8, T.G.B.; 1 young and 1 egg (addled) May 10, G.R.R. and H.R.H.

Rook—building in wilderness Mch 1, T.G.B.; 3 Mch 13, F.H.F.; nearly fledged May 13, A.J.B.

Jackdaw—4 in open nest at Rockley, May 5, F.H.F.; young May 20, W.F.C. and W.O.C.

Magpie—3 Ap. 19, A.C.D.P.; 6 May 6, T.L.K.; 7 May 20, W.F.C. and W.O.C.

Jay—2 May 13, T.L.K.; 3 May 17, T.S.E., A.S.M.

Wren—young flying May 13, T.G.B.; 1 egg May 20, W.F.C. and W.O.C.

Nuthatch—1 May 13, C.H.V.

Cuckoo—heard at Savernake Ap. 12, *Mr. Nicholl*; at Marlborough Ap. 24, *Mrs. Thompson*; Ap. 28, T.G.B.; egg in Hedgesparrow's nest May 21, G.N.G.; note changed June 26, A.H.D.

Kingfisher—seen May 8, W.H.N.

Swallow—seen Nov. 12, 1876, T.G.B.; Ap. 7 (Marlb.) N.M.; Ap. 11 (Marlb.), *Mr. Coleman*; Ap. 12 (Ramsbury), E.M.; Ap. 24 (Pewsey), *S. B. Dixon, Esq.*; 1 egg June 27, H.R.H.

Martin—2 seen Oct. 11, 1876, T.G.B.; seen Nov. 3, 1876, E.S.M.; seen Ap. 2, *Mr. L. G. Crow*; 2 flocks at Ramsbury, Ap. 11, E.M.

Sand Martin—seen Ap. 16, N.M.; Ap. 27, T.G.B.; 11 eggs June 27, H.R.H.

Swift—seen Ap. 27 (Bedwyn), E.G.W.; May 3 (Marlb.), E.M.R.C., C.W.B.J.; May 4 (Ramsbury), E.M.; young June 27, H.R.H.

Goatsucker—eggs May 7 (by a boy not in the School).

Ring Dove—2 May 11, T.L.K.; 2 May 13, A.J.B.; eggs and young May 20, H.R.H.

Stock Dove—May 19, G R.R.; 3 July 12, H.R.H.

Turtle Dove—heard May 8, T.G.B., E.S.M.; 1 June 17, H.R.H.

Pheasant—7 May 1, H.S.S.

Partridge—1 May 7, E.S.M.

Red-legged Partridge—2 picked up dead Mch 23, 1 shot Ap. 14, *Mr. Coleman*; 5 eggs May 3, H.R.H.

Peewit—4 May 8, E.S.M., H.R.H.; 4 eggs and 4 young May 10, G R.R. and H.R.H.; large flock Jan. 31 and Feb. 21, T.G.B.

Land Rail—heard Ap. 20 (Ramsbury), E.M.; Ap. 28 (Marlborough), E S.M.

Golden Plover—flock flying N. over Marlborough Feb. 7, *Mr. Green*.

Moorhen—building Mch 23, F.H.F.; 1 Ap 30, H.R.H.; 2 May 1, F.H.F.

Coot—2 May 19, G.N.G.; 5 May 19, *Mr. Foster*.

Wild Duck—flock of 50 seen at Ramsbury Nov. 10, 1876, T.G.B.; 6 eggs Mch 10, E.S.M., W.A F.

Little Grebe—1 May 1, F.H.F.; eggs May 3, F.H.F.; 3 May 22, E.M.R.C. and R.B.D.

The following account, kindly furnished by the Rev. C. W. Tayler, will prove of interest.

A robin built its nest by the side of a path leading to the Church and in due course laid her 3 eggs in it: these three eggs were taken. Soon afterwards a robin built her nest close by and took the lining of the robin's nest to make her own with: another robin took the old dismantled nest and without stopping to repair it, laid 6 eggs in it, five of which were hatched. A little time ago a third robin rebuilt the same nest and she laid 6 eggs in it, all of which are hatched. We pass this nest every day and have at different times gone to see the nest. Each robin has allowed us to put our faces close and to see her without being in the least alarmed. We have thus been able to watch the growth of the 11 robins.

T. A. PRESTON.

BOTANICAL REPORT.

ABOUT 470 species have been observed, not only at the time of first flowering, but throughout the year: unfortunately a few breaks have occurred, and the exact date of some few species has been lost. The break for the Easter holidays was remedied by Rev. C. E. Thorpe, but with the exception of a few good workers, the aid from the School has been far less than usual—in fact the list of workers is considerably shorter than it has ever been before.

We have been able to add slightly to our list of Localities, and three species may be considered as additions to our list of plants, though they are rather escapes from cultivation, and not true British species. These are

Lepidium sativum—one plant found near the Canal by W. M. H. Milner on May 19.

Erysimum orientale—came up spontaneously in the garden of F. E. Hulme, Esq.; with respect to this he says "The authorities give the South-eastern counties, Kent, Sussex, Essex, as the ordinary habitat. I last year had a packet of seeds from a florist at Battle, in Sussex. It probably got collected with garden seeds, but if so it is curious that the seed should have lain dormant till this year, as all those flower seeds certainly were put in last season; none remained for this season's sowing."

Lolium Italicum—This may now be safely added to the list. It is often grown as a crop, and no doubt stragglers have sprung up elsewhere.

Of new localities may be mentioned:

Thalictrum flavum—Ramsbury, F. J. H. Jenkinson.

Papaver strigosum—Poulton.

Polygala depressa—Near Wolfhall.

Stellaria aquatica—Near Ramsbury.

Geranium pusillum—Near Ramsbury.

Genista tinctoria—Marlborough Common, F. E. Thompson, Esq.; Downs near Rabley, Rev. G. W. De Lisle.

Melilotus officinalis—Near Folly Farm.

Vicia tetrasperma—Near Ramsbury.

Hydrocotyle vulgaris—Near Ramsbury.

Torilis nodosa—Near Ramsbury, F. J. H. Jenkinson.

Pedicularis palustris—Near Ramsbury.

Ophrys Apifera—Unusually abundant at Martinsell, also near Ramsbury.

A few other notes worth recording, are as follows :—

A specimen of *Prunus spinosa* was found on June 30th.

Potentilla fragariastrum, still out, June 26th.

Gentiana amarella—A few very small plants in flower, June 5th, by *W. M. H. Milner*.

Names of those whose initials occur in the following list :—

E.L.B.	E. L. Brown
T.G.B.	T. G. Brown
C.M.B.	C. M. Bnll, Esq.
W.H.C.	W. H. Chappel
J.H.C.D.	J. H. C. Dalton
S.J.D.	S. J. Daltry
G.E.D.	G. E. Dartnell, Esq.
R.D.	R. Dawson
G.W.D.L.	Rev. G. W. De Lisle
W.H.M.D.	W. H. M. D'Urban
E.F.	E. Feetham
K.G.	Miss K. Gwillim
F.E.H.	F. E. Hulme, Esq. F.L.S., F.S.A.
E.F. im T.	E. F. im Thurn, Esq.
F.J.H.J.	F. J. H. Jenkinson, Esq.
T.G.J.	T. G. Jnckes
W.H.M.	W. H. Macdonald, Esq.
N.M.	N. Masterman, Esq.
M.	W. M. H. Milner
D.E.O.	D. E. Olivier
E.A.O.	Miss E. A. Ormerod
E.P.	Miss E. Preston
M.P.	Miss Preston
W.M.R.	W. M. Richards
G.J.S.	G. J. Scott
F.E.T.	F. E. Thompson, Esq.
C.E.T.	Rev. C. E. Thorpe
E.G.W.	E. G. Waddilove

Clematis—

Vitalba ... bud, July 9, M.

Thalictrum—

flavum ... ... full bud, June 30, F.J.H.J.

Anemone—

nemorosa ... Feb. 16, E.G.W.; Feb. 27, Mch. 14, E.G.W.

Myosurus—

minimus ... over, June 15.

Ranunculus—

peltatus ... Ap. 10, C.E.T.
c. penicillatus Ap. 24, F.E.T.
Flammula ... June 14 (cult.), June 23, M.
auricomus ... Ap. 24, F.E.T.
acris ... ... Jan. 5, Feb. 19; Ap. 24, F.E.T.
repens ... ... May 3, 6, 15.
bulbosus .. Jan. 30, Mch. 25, Ap. 24, F.E.T.
parviflorus ... May 24, (cult.)
arvensis ... May 19, M.
Ficaria Jan. 5, K.G.; Jan. 19, K.G.

Ca'tha—
palustris ... Feb. 8, F.E.T.; Feb. 14, M.

Helleborus—
viridis ... ... by Feb. 18, F.E.T.

Aquilegia—
vulgaris ... June 2.

Papaver—
Rhœas ... June 15, E.P.
b. strigosum full, July 13.
dubium ... June 8, E.G.W.

Chelidonium—
majus ... ... May 21, E.G.W.

Fumaria—
officinalis ... by May 12, M.; June 14.

Raphanus—
Raphanistrum June 23, G.W.D.L.

Sinapis—
arvensis ... Mch. 6, Ap. 12, C.E.T.
alba ... ... with seed, June 14.

Brassica—
oleracea ... by May 12, M.
Napus ... ... Ap. 7, C.E.T.
Rutabaga .. by May 3.

Sisymbrium—
officinale ... June 7, M.
Alliaria .. bud, Ap. 16, C.E.T.; Ap. 30, G.W.D.L.

Erysimum—
orientale ... June 4, F.E.H.

Cardamine—
pratensis ... c. bud, Mch. 14, F.E.T.; Ap. 1, C.E.T.
hirsuta... ... Feb. 14.
sylvatica ... Ap. 20, C.E.T.

Arabis—
thaliana ... Ap. 20, C.E.T.
hirsuta ... June 28, E.G.W.

Barbarea—
vulgaris ... May 13, M.

Nasturtium—
officinale ... June 9, M.

Armoracia—
rusticana ... June 14.

Draba—
verna ... ... Feb. 18, F.E.T.

Capsella—
Bursa-pastoris Ap. 10, C.E.T.

Lepidium—
campestre ... with seed, May 18, G.W.D.L.
sativum ... May 19, M.

Senebiera—
Coronopus ... June 14.

Reseda—
lutea ... ... June 13, M.

Helianthemum
vulgare ... May 31, G.W.D.L.

Viola—
odorata ... Feb. 25, E.G.W. and W.H.M.D.
hirta ... ... Mch. 15, F.E.T.
sylvatica
a. Riviniana Ap. 24, F.E.T.
b. Reichenbachiana... May 8, E.G,W.

canina ... ... May 5, F.E.T.
tricolor ... May 12, E.G.W.
b. arvensis ... Ap. 1, C.E.T.

Polygala—
vulgaris ... May 31, G.W.D.L.
depressa ... May 19.
calcarea ... May 15, E.F.

Silene—
inflata ... ... May 13, M.; June 16, M.

Lychnis—
vespertina ... June 2, M.
diurna ... ... May 7, F.E.T. (Pewsey); May 15, E.F.
Flos-cuculi ... June 10, C.E.T.
Githago ... June 24, G.W.D.L.

Moenchia—
erecta ... ... May 10, W.H.M.

Cerastium—
glomeratum May 3.
triviale ... all the year.

Stellaria—
aquatica ... by June 30.
media ... ... all the year.
Holostea ... March 26.
graminea ... May 26.
uliginosa ... May 19.

Arenaria—
trinervis ... May 15.
serpyllifolia May 3.

Sagina—
procumbens by June 14.

Scleranthus—
annuus ... by June 14.

Montia—
fontana ... May 10, W.H.M.

Hypericum—
perforatum ... July 7, G W.D.L.
tetrapterum July 13.
pulchrum ... July 4, M.
hirsutum ... June 29.

Malva—
moschata ... July 5, G.W.D.L. July 13.
sylvestris ... June 14.
rotundifolia ... May 6.

Tilia—
intermedia ... July 15.

Linum—
catharticum June 8, G.W.D.L.

Geranium—
phæum ... May 26, (cult.)
pratense ... June 15, G.W.D.L.
molle ... ... April 29, C.E.T.
pusillum ... full June 30.
rotundifolium May 25, (cult.)
dissectum ... May 31, G.W.D.L.
columbinum June 14.
lucidum ... May 18, E G.W.
Robertianum Feb. 25, C.E.T.; May 19, M.

Erodium—
cicutarium ... by May 19, M.

Oxalis—
Acetosella ... bud Ap. 16, C.E.T. May 1, E.P.

Ilex—
Aquifolium ... May 31, G.W.D.L.

Euonymus—
europæus ... June 9.

Rhamnus—
catharticus ... by June 14.

Acer—
Pseudo-platanus May 6, F.E.T.
campestre ... May 26.

Ulex—
europæus ... till June 30.

Genista—
tinctoria ... cold. bud June 23, G.W.D.L.

Sarothamnus—
scoparius ... April 29, C.E.T.
Ononis—
arvensis ... July 13, G.W.D.L.
Anthyllis—
vulneraria ... May 15, E.F. and E L.B.
Medicago—
lupulina ... May 13, M.
Melilotus—
officinalis ... by July 13.
Trifolium—
pratense ... May 16, G.W.D.L.
medium ... full July 20.
incarnatum... June 7.
hybridum ... July 4, M.
repens ... ... June 2, M.
procumbens June 16, M.
minus ... .. by May 19.
Lotus—
corniculatus June 5, D.E.O.
major ... ... June 16, G.W.D.L.
Hippocrepis—
comosa ... June 13, M.
Onobrychis—
sativa ... ... June 2, M.
Vicia—
hirsuta... ... May 15,
tetrasperma full June 30, M.
Cracca ... June 23, M.
sylvatica ... June 30, M.
sepium... ... May 15, G.W.D.L.
sativa ... ... May 19.
angustifolia May 31, G.W.D.L.
Lathyrus—
pratensis ... June 16, G.W.D.L.
Orobus—
tuberosus ... May 8, T.G.J.
b. tenuifolius May 12, E.G.W.
Prunus—
spinosa ... Feb.5,M.; 6,W.M.R, E.F.,G.J.S.;Mch. 17,R.D.; Mch.24, E.G.W.
Cerasus ... April 26.
Spiræa—
Ulmaria ... June 22, G.W.D.L.
Agrimonia—
Eupatoria ... June 27, G.W.D.L.
odorata ... full July 27.
Poterium—
Sanguisorba.. May 15, E.L.B.
Alchemilla—
arvensis ... Ap. 26, F.E.T.
vulgaris ... May 19, M.
Potentilla—
Fragariastrum Feb. 11, C.E.T.
Tormentilla... May 17, G.W.D.L.
reptans ... June 19, D.E.O.
anserina ... c.bud May 19(Wolfhall); May 26.
Fragaria—
vesca ... ... Ap. 12, C.E.T.
Rubus—
Idæus ... ... June 16, M.
discolor ... by July 25.
pygmæus ... July 12.
Radula ... June 26.
corylifolius ... June 29.
cæsius ... ... June 9, M.
Geum—
urbanum ... May 16, G.W.D.L.
intermedium.. June 2, M.
rivale ... ... about May 12; G.W.D.L.
Rosa—
tomentosa ... by June 30, M.
canina ... ... June 13, M.
arvensis ... June 26.
Cratægus—
Oxyacantha... May 19, E.G.W.

Pyrus—
Malus ... ... May 25, J.H.C.D.
Epilobium—
hirsutum ... by July 25.
parviflorum... c. bud, July 12.
montanum ... June 14.
palustre ... July 4, M.
Circæa—
lutetiana ... June 29, F.E.T.
Myriophyllum—
spicatum ... July 4, M.
Callitriche—
verna ... ... May 26.
Bryonia—
dioica ... ... June 23, M.
Ribes—
Grossularia .. Mch. 18, C.E.T.
rubrum ... Ap. 10, C.E.T.
Sedum—
album ... ... c. bud July 13.
acre ... ... June 20, M.
Saxifraga—
tridactylites .. Mch. 11, F.E.T.
granulata ... Ap. 26.
Hydrocotyle—
vulgaris ... June 30, W.H.C.
Sanicula—
europæa ... May 21, E.P.
Helosciadium—
nodiflorum ... June 26, F.E.T.
Ægopodium—
Podagraria ... June 7.
Bunium—
flexuosum ... May 19, M.
Pimpinella—
Saxifraga ... July 25.
Sium—
angustifolium June 30 (Ramsbury), F.J.H.J.; July 28 (Marlb.)
Œnanthe—
fistulosa ... July 1 (cult.)
crocata .. ... June 18, F.E.T.
Æthusa—
Cynapium ... June 16.
Pastinaca—
sativa ... ... Feb. 8, G.W.D.L.; Ap. 8, C.E.T.
Heracleum—
Sphondylium May 18.
Daucus—
Carota ... ... June 22, G.W.D.L.
Torilis—
infesta ... ... June 16, D.E.O.
Anthriscus ... July 4, M.
nodosa ... ... full June 30, F.J.H.J.
Chærophyllum—
sylvestre ... Feb. 5, E.G.W. and T.G.B.; Feb. 14. M.; Ap. 1, C.E.T.;
temulum ... June 2, M.
Scandix—
Pecten-Veneris Ap. 1, C.E.T.
Cornus—
sanguinea ... June 16, D.E.O.
Adoxa—
Moschatellina by March 17.
Sambucus—
nigra ... ... June 7, D.E.O.
Viburnum—
Opulus ... b. June 10, C.E.T.; fertile, June 15.
Lantana ... May 9, E. F. im T.
Lonicera—
Periclymenum June 23, M.
Galium—
cruciatum ... April 30, G.W.D.L.
verum ... ... June 27, G.W.D.L.
Mollugo ... June 23, M.
saxatile ... June 7.
palustre ... June 26, F.E.T.
c. Witheringii June 30.

uliginosum ... June 23, M.
Aparine ... May 15.
Asperula—
odorata ... May 21, E.P.
cynanchica ... June 16, M.
Sherardia—
arvensis ... May 2, G.W.D.L.
Valeriana—
dioica ... ... May 19, M.
officinalis ... June 10, E.G.W. and W.H.M.D.
Valerianella—
olitoria ... by April 30.
dentata ... May 3.
Scabiosa—
columbaria ... June 29, E.A.O.
arvensis ... June 16, E.G.W.
Onopordum—
Acanthium ... about July 20, cult.
Carduus—
nutans ... June 13, M.
crispus ... June 2, M.
lanceolatus July 13.
palustris ... June 14, M.
tuberosus ... July 13 (cult,)
acaulis ... July 15, G.W.D.L.
arvensis ... July 4, M.
Arctium—
nemorosum... July 30.
Centaurea—
nigra ... ... June 28, E.A.O.
Scabiosa ... June 27, E.A.O.
Cyanus ... July 2, G.E.D.
Chrysanthemum—
segetum ... full July 4, M.
Leucanthemum June 7, G.W.D.L.
Matricaria—
inodora ... March 6, Ap. 26, July 13.
Anthemis—
Cotula ... ... June 30, M.
Achillea—
Millefolium ... June 16, G.W.D.L.
Senecio—
vulgaris ... all the year.
Jacobæa ... June 19, M.; not in fl. till July.
aquaticus ... June 22, G.W.D.L.
campestris ... full June 29, F.E.T.
Erigeron—
acris ... ... June 15 (cult.)
Tussilago—
Farfara ... Feb. 14, F.E.T.
Petasites—
vulgaris ... Feb. 8, F.E.T.
Lapsana—
communis ... June 30, M.
Hypochœris—
radicata ... June 2, M.
Leontodon—
hirtus ... ... July 1.
hispidus ... June 2, M.
autumnalis ... June 14.
Tragopogon—
pratensis ... by June 14.
Taraxacum—
officinale ... all the year.
Sonchus—
oleraceus ... June 22, G.W.D.L.
asper ... ... by June 14.
arvensis ... by July 27.
Crepis—
virens ... ... June 10, C.E.T.
Hieracium—
Pilosella ... May 15.
boreale... ... July 5 (cult.)
Campanula—
glomerata ... June 9, M.
trachelium ... by July 21, G.W.D.L.
rotundifolia... July 12, E.G.W.
Specularia—
hybrida ... nearly over July 4, M.

Fraxinus—
excelsior ... Ap. 9, C.E T.
Ligustrum—
vulgare ... June 23, M.
Vinca—
major ... ... Feb. 17, E.G.W.; W.H.M.D.
minor ... ... by Feb. 11, T.G B.
Erythræa—
Centaurium... July 12, E.F.; W.H.M.D.
Gentiana—
Amarella ... June 5, M.
Menyanthes—
trifoliata ... full, June 23, M.
Convolvus—
arvensis ... June 28, M.
sepium ... July 25, C.E.T.
Solanum—
Dulcamara ... June 20, D.E.O.
Scrophularia—
Balbisii ... June 16, G.W.D.L.
nodosa ... ... June 10, G.E.D.; June 14.
Linaria—
Cymbalaria... by Feb. 16.
vulgaris ... June 23, G.W.D.L.; June 28, M.; July 22, C.E.T.
minor ... ... June 30, M.
Veronica—
hederifolia ... all the year till end of May, some in July.
polita ... ... all the year.
agrestis ... Jan. and April.
Buxbaumii ... all the year till end of June.
arvensis ... May 8, E.F.imT.
serpyllifolia... May 3.
officinalis ... June 20, M.
Chamædrys... by Ap. 26.
montana ... by June 14.
scutellata ... full, July 12.
Anagallis ... by June 14.
Beccabunga .. June 14.
Euphrasia—
officinalis ... June 28, E.A.O.
Bartsia—
Odontites ... July 4, M.
Pedicularis—
palustris ... June 23, M.
sylvatica ... May 19, G.W.D.L.
Rhinanthus—
Crista-galli ... May 26, J.H.C.D.
Melampyrum—
pratense ... June 7, D.E.O.
Lathræa—
squamaria ... full, Ap. 26.
Orobanche—
minor ... ... June 27, G.W.D.L.
Thymus—
Serpyllum ... June 13, G.E.D.
Calamintha—
Clinopodium July 9, M.
menthifolia... July 26 (cult.)
Nepeta—
Glechoma ... full, Ap. 26.
Salvia—
Verbenaca ... June 23, M.
Prunella—
vulgaris ... June 22, G.W.D.L.; white var., July 6, W.H.M.
Scutellaria—
galericulata... June 30, M.
Ballota—
nigra ... ... June 30, F.J.H.J.
Stachys—
Betonica ... July 13.
palustris ... July 4, M.
sylvatica ... June 22, G.W.D.L.

Galeopsis—
Ladanum ... by July 30, W.H.M.
Tetrahit ... July 4, M.; July 25.
Lamium—
amplexicaule full, May 12, M.
purpureum ... all the year.
album .. ... all the year.
Galeobdolon Ap. 26, F.E.T.
Ajuga—
reptans ... May 1, May 8, E.P.
Echium—
vulgare ... July 3, E.G.W.
Lithospermum—
officinale ... June 14.
arvense ... May21,(Oare)G.E.D.
Myosotis—
palustris ... June 16, G.W.D.L.
arvensis ... Ap. 20, C.E.T.
collina ... ... Ap. 26.
versicolor ... byMay19,G.W.D.L.
Anchusa—
arvensis ... full July 4, M.
Borago—
officinalis ... June 3.
Symphytum—
officinale ... Ap. 24, F.E.T.
asperrimum June 7, M.
Cynoglossum—
officinale ... June 12, G.W.D.L.
Primula—
vulgaris ..... till end of May
b. caulescens full Ap. 26, F.E.T.
officinalis ... Ap.7,F.E.T.; July3 M.P.
Lysimachia—
Nummularia June 30.
nemorum ... May 27, M.
Anagallis—
arvensis ... by May 13, M.
Plantago—
major ... ... June 17, D.E.O.
media ... ... June 8, G.W.D.L.
lanceolata ... bud Ap. 14, C.E.T; Ap. 24, F.E.T.
Chenopodium—
album ... ... July 4,M.; July 25.
B. Henricus... June 26, M.
Atriplex—
angustifolia... July 30.
erecta ... ... July 26.
Rumex—
conglomeratus July 12.
nemorosus ... June 30.
obtusifolius... June 14.
crispus... ... budJune2; June26.
Hydrolapathum July 13.
Acetosa ... May 19.
Acetosella ... May 18, G.W.D.L.
Polygonum—
Convolvulus ... June 25; June 29, E.G.W.
aviculare ... June 16, G.W.D.L.
Persicaria ... bud July 4, M.; July 26.
amphibium... June 12, G.E.D.
Daphne—
Laureola ... Jan. 25, (cult.)
Buxus—
sempervirens Feb. 17, E.G.W.
Euphorbia—
Helioscopia... all the year.
amygdaloides Ap. 9, C.E.T. (full bud Ap. 29, E.G.W.)
Peplus... ... all the year. Ap.30, G.W.D.L.
exigua... ... June 30.
Mercurialis—
perennis ... barren June 25; fertile, Feb. 7, E.G.W.
Urtica—

dioica ... ... May 31.
urens ... ... May 3.

Ulmus—
suberosa ... Feb. 14.
montana ... Feb. 27.

Quercus—
Robur ... ... May 26.

Fagus—
sylvatica ... May 17, M.

Corylus—
Avellana ... byJan. 17, E.G.W.

Carpinus—
Betulus ... Ap. 11, C.E.T.

Alnus—
glutinosa ... over May 10, M.

Betula—
verrucosa ... May 16, G.W.D.L.

Populus—
nigra ... ... full May 12, M.

Salix—
triandra ... by Ap. 24, F.E.T.
viminalis ... March 14.
caprea ... .. Feb. 17, M.

Taxus—
baccata ... Feb. 11.

Sparganium—
ramosum ... July 13.

Arum—
maculatum ... not open Ap. 10, C.E.T.; open May 3, E.P.

Potamogeton—
natans ... full, July 4, M.

Triglochin—
palustre ... June 30, M.

Orchis—
pyramidalis June 25, F.E.T.
ustulata ... June 10, N.M.
Morio ... ... May 12, E G W.
mascula ... April 26, F.E.T.
incarnata ... June 4, G.W.D.L.
latifolia ... June 23, M.
maculata ... June 10, G.E.D.

Gymnadenia—
conopsea ... June 16.

Habenaria—
viridis ... ... June 29.
bifolia ... ... June 20, M.
chlorantha ... June 7, G.W.D.L.

Ophrys—
apifera... ... June 25, F.E.T.

Listera—
ovata ... ... May 26.

Cephalanthera—
grandiflora ... June 8, G.E.D.

Iris—
Pseudacorus June 14.

Narcissus—
Pseudo-narcissus Feb. 14.

Galanthus—
nivalis... ... Jan. 21, C.M.B.

Tamus—
communis ... June 16, G.W.D.L.

Polygonatum—
multiflorum... full bud. May 27 S.J.D

Ruscus—
aculeatus ... all the winter till Jan. 2.

Scilla—
nutans ... ... April 10, C.E.T.

Allium—
ursinum ... May 22, E.G.W.

Luzula—
pilosa ... ... April 6, C.E.T.
campestris ... April 24, F.E.T.
multiflora ... May 18, M.

Juncus—
effusus ... ... June 30.
lamprocarpus June 30, M.
bufonius ... full July 4, M.

Scirpus—

palustris ... by June 14.
Carex—
paniculata ... May 19.
vulpina ... by June 14.
muricata ... budApril24,F.E.T.; May 13, M.
divulsa... ... by June 14.
glauca ... ... April 26.
præcox ... May 8.
sylvatica ... May 6, M.
flava ... ... nearly over June 30, M.
hirta ... ... May 19.
paludosa ... spikes, May 3.
riparia ... ... spikes, May 3.
Anthoxanthum—
odoratum ... April 24, F.E.T.
Digraphis—
arundinacea June 18, F.E.T.
Alopecurus—
agrestis ... May 15.
geniculatus... by June 14.
pratensis ... Ap. 1, C.E.T.
Phleum—
pratense ... June 14.
b. nodosum ... full June 29.
Agrostis—
alba ... ... June 30
vulgaris ... June 23.
Milium—
effusum ... by May 15.
Aira—
cæspitosa ... by June 14.
flexuosa ... June 7, M.
Avena—
flavescens ... by June 14.
pubescens ... May 15.
pratensis. ... May 31.
elatior ... ... by June 14.
Holcus—
mollis ... ... June 30.
lanatus ... May 30, E.G.W.
Koeleria—
cristata ... May 31.
Melica—
uniflora ... May 9, E.G.W.
Glyceria—
fluitans ... by June 14.
plicata ... May 19, M.
aquatica ... June 22, G.W.D.L.
Poa—
annua ... ... all the year.
nemoralis ... full June 30.
pratensis ... April 24, F.E.T.
trivialis ... May 26.
Briza—
media ... ... May 28, F.E.T.
Cynosurus—
cristatus ... by June 14.
Dactylis—
glomerata ... May 26.
Festuca—
ovina ... ... by May 10.
rubra ... ... May 19.
elatior
b. arundinacea full June 29.
pratensis ... June 14.
b. loliacea ... June 14.
Bromus—
giganteus ... July 4.
asper ... ... June 14.
erectus ... May 8.
sterilis ... by May10,E.FimT.
racemosus ... June 30.
mollis ... ... May 8.
Brachypodium—
sylvaticum ... June 29.
Triticum—
caninum ... by June 30.
repens ... ... June 26.
Lolium—
perenne ... May 10, E.F.imT.

Italicum	... by June 14.	vulgatum	... by June 16.
Hordeum—		Equisetum—	
pratense	... June 26, F.E.T.	arvense	... April 24, F.E.T.
Lomaria—		palustre	... July 12.
spicant	... June 15.	limosum	... bud Ap. 20,C.E.T.; May 13, M.
Ophioglossum—			

In addition to the above, the following cultivated species have been observed:—

Hepatica triloba	Jan. 25.
Eranthys hiemalis	Jan. 25.
Barbarea striota	May 18.
Æsculus Hippocastanum ...	May 27, E.G.W.
Geranium sylvaticum ...	May 30.
Cytisus Laburnum	May 27.
Vicia Faba	May 16, G.W.D.L.
Pyrus Aucuparia	May 24, F.E.T.
Pyrus japonica	Feb. 4.
Peach	Feb. 18, *Miss Manders.*
Cherry	April 8, C.E.T.
Pear	April 9, C.E.T.
Ribes sanguineum	March 29 to May 6.
Cornus mascula	Jan. 25.
Staphylea pinnata	April 10.
Syringa vulgaris (*Lilac*) ...	April 12, *W. Mansell, Esq.*
Lonicera	full June 5.
Symphoricarpos racemosus ...	June 23, M.
Lycium barbarum	June 16, D.E.O.
Tamarix	June 16, *W. Mansell, Esq.*
Pulmonaria officinalis ...	Feb. 25.
Daphne Mezereum	Jan. 4.
Larix europæus	March 18, M.
Wheat	June 19, G.W.D.L.
Rye	June 12, M.
Barley	June 23, G.W.D.L.
Oats	June 23, G.W.D.L.

The following Table is drawn up to show the abundance of flowers at any particular time. Each month is divided into four quarters. In the first column are the number of plants actually in flower at the commencement of each quarter; in the next, the number of plants which came into flower during that quarter, a third column gives the number of "casuals," *i.e.*, those specimens which are particularly early or particularly late, but of which the *species* cannot be considered in flower; the last column gives the total number of species of which flowers were procured. There are certain difficulties in drawing up such a list, and this first attempt can only be taken as an *approximation*, which we hope to make more and more exact, as experience enables us to overcome our difficulties.

The following observations must be made:—

(1). When the plant was "in flower" when first observed, it is often impossible to tell how long it has been out—when it has been observed "in bud" it is sometimes possible to guess fairly when it first came out, but not always. Hence after a regular botanical search, we often obtain an unusually large number of "first notices;" when this is the case, some ought to be referred to the previous quarter, though not always.

(2). The date when a plant is "over" is still more difficult to determine —a few odd stragglers going on for some time after the species may be said to have ceased flowering. We have allowed these stragglers to count and only when we get no more specimens is the species considered as "over."

(3). In the case of those plants which only grow beyond an ordinary walk, or in special localities, one notice is often only secured. A certain time has been allowed for it to be considered "in flower," and it has not been counted afterwards.

(4). *Casuals* are those plants which are considered as exceptional in the time of flowering. In the early months of the year these are very common. In a warm spot a species may be found in flower, *e.g.*, *Veronica Chamædrys*, on January 4th, but its proper time of flowering is from the end of April to the end of Sept., rarely is it in flower in October: consequently it ought not to be included among those properly in flower in January.

(5.) The weather during November and December was peculiarly mild; on the ground the temperature fell occasionally below freezing, but the mean temperature during November, on the grass, was only 0·7° below freezing, whilst for December it was as much as 4·1 *above* it. The natural result was that on the 1st January an unusual number of plants were still in flower, though the continued wet made this number very much smaller as time went on.

(6.) In examining the number of "species come into flower," it will be observed that they are very variable at times. On the 19th of May, there was a "Field-day" to Wolfhall, and on the 30th June to Chilton—this latter added enormously to our list, which thus included species not occurring very near Marlborough. On April 26th we had a search, having just re-returned after the holidays. And on June 14th another search was instituted after a fortnight's break. The weather had been very fine during the latter part of that time, and things came very fast into flower.

	Date.	No. in flower.	Came into flower.	Casuals.	Total.
January	1-7	30	—	1	31
	8-15	23	—	—	23
	16-22	21	1	1	23
	23-31	22	4	2	28
February	1-7	22	—	2	24
	8-14	20	5	2	27
	15-21	24	10	4	38
	22-28	34	2	2	38
March...	1-7	35	—	2	37
	8-15	35	3	—	38
	16-22	37	4	1	42
	23-31	41	2	1	44
April	1-7	42	8	—	50
	8-15	50	9	1	60
	16-22	57	3	—	60
	23-30	60	29	3	92
May	1-7	85	19	3	107
	8-15	95	33	3	131
	16-22	121	32	1	154
	23-31	141	23	—	164
June	1-7	146	24	1	171
	8-15	167	63	2	232
	16-22	191	31	—	222
	23-30	217	72	2	291
July	1-7	230	23	3	253
	8-15	242	19	1	262
	16-22	221	4	—	225
	23-30	221	19	7	247

Date.		Weather.	Rain-fall. ins.	Degrees of Frost.	Range of Temperature.
January ...	1-7	Very wet, and mild ...	2·636	1	16°7
	8-15	Wet and mild	·976	13	21·8
	16-22	Mild, but damp	·750	7	20·3
	23-31	A little cooler, but still mild and wet	1·291	16	20·8
February ..	1-7	Mild and damp	·464	9	23·4
	8-15	Very mild	·437	—	15·2
	16-22	Much cooler	·599	7	20·2
	23-28	Cold, especially the last two days, snow on 26 & 27	·108	30	25·2
March	1-7	Cold, especially the 1st, with snow and fog ...	·321	17	31·1
	8-15	Cold	·200	34	26·8
	16-22	Very cold	·286	52	22·5
	23-31	Mild and wet, with two thunderstorms	1·607	25	32·8
April	1-7	Mild and wet	1·848	4	20·6
	8-15	Mild	·477	0	23·0
	16-22	Cold, damp, and windy ...	·705	11	29·3
	23-30	Cold and dull	·640	13	22·4
May.....	1-7	Very cold indeed	——	62	36·0
	8-15	Cool and dull	·812	6	29 0
	16-22	Cold and dull	·752	—	20·3
	23-31	Cold	1·024	14	32·9
June	1-7	Milder	·712	—	33·6
	8-15	Very warm	·032	—	30·5
	16 22	Very warm and fine ...	·097	—	34·0
	23-30	A little cooler	·274	—	33·7
July.....	1-7	Cool and damp	0 651	—	28·0
	8-15	A little warmer with heavy rain on 14th	2·565	—	30·7
	16-22	Cool	·398	—	20·1
	23-31	Mild, the last 3 days being very hot...	1·417	—	33·9

ENTOMOLOGICAL LIST.

As this is probably the last time I shall have the honour of editing this list before my departure from England, I have thought it best to publish it in a complete and carefully revised form, so as to establish a firm basis for the operations of future collectors. Some species, previously recorded, I have intentionally omitted as probably in error, but without any indication of the omission besides the non-occurrence of the name. Deducting these, the total number of species is 906; the addition of fresh species is now rather slow, but I estimate that the total number occurring in the district cannot be less than 1100, so there is still plenty of opportunity for the energetic. Species not previously recorded, are printed in small capitals. The mode of indication of dates, localities, &c., is the same as that employed in the last complete list of 1873. We have the honour of including in our lists one insect, at least, (*Myelois Cirrigerellà*), which is not found elsewhere in Britain; as well as one or two of considerable rarity.

The season has been principally remarkable for its very unusual lateness; insects have been more backward this year than on any previous occasion within my limited experience. The number of notices is more meagre than I had hoped to make it; but, personally, I have been frequently absent for considerable periods of the summer in other parts of England. I have however much pleasure in recording that I am specially indebted for assistance to Mr. N. Manders, who has been indefatigable in collecting, frequently at the expense of considerable personal discomfort, and has added some interesting new species (principally *Noctuae*) to our lists.

The following are the names occurring in the lists: when none is given, my own is intended.

C.M.C.	C. M. Cox.
O.E.	O. Elton.
S.V.H.	S. V. Hume.
F.J.H.J.	F. J. H. Jenkinson, Esq., O.M.
N.M.	N. Manders, Esq., O.M.
T.A.P.	Rev. T. A. Preston.
S.P.	S. Pearse.
S.G.W.	S. G. Waddilove.

E. MEYRICK.

RHOPALOCERA.

Gonepteryx Rhamni ...	very common	Feb. 10, N.M., O.E. May 24.
Colias Edusa	common this year ...	Jn. 9, O.E.
C. Hyale	occasional, Ramsbury.	
Pieris Brassicae	abundant	My. 25.
P. Rapae...	ditto	Apr. 1.
P. Napi	ditto	My. 25, N.M.
Anthocharis Cardamines	common	My 25, N.M.; Jn. 29.
Leucophasia Sinapis ...	formerly, Rabley W.&c.	
Arge Galathea	Bedwyn, &c., common locally	Jy.10,E.G.W.; Aug.3.
Lasiommata Aegeria ...	common in woods ...	My. 5, N.M.
L. Megaera	very common	Jn. 7, E.G.W.
Hipparchia Semele ...	Aldbourne, &c.; scarce	
H. Janira	abundant	Jn. 19, E.G.W.
H. Tithonus	ditto	Jy. 26.
H. Hyperanthus	very common	Jy. 2, O.E.
Coenonympha Pamphilus	abundant	Jn. 7, E.G.W.
Limenitis Sibilla	Stype W., Loves W., Henswood	Jy. 20, N.M.
Apatura Iris	Stype W., rather common	Aug.—, Mr.Coleman.
Cynthia Cardui	common on downs; this year abundant	Jn. 5, O.E.
Vanessa Atalanta	common	Apr.10, N.M.; Aug.8.
V. Io	common	My.24, O.E.; Aug.15.
V. Antiopa	once, Sav. Forest.	
V. Polychloros	rather common	Apr. 10, N.M.
V. Urticae	abundant	Jn. 18.
Grapta C-album	Marlborough, twice.	
Argynnis Paphia	common in woods ...	Jy. 28, N.M.
A. Adippe	Sav. Forest, &c.... ...	Jy. 12, E.G.W.
A. Aglaia	ditto	Jy. 12. E.G.W.
A. Selene	ditto	Jn. 10, E.G.W.
A. Euphrosyne	common in woods ...	Jn. 5, O.E.
Melitaea Cinxia	formerly near Bedwyn.	
M. Athalia	ditto.	
M. Artemis	Chisledon, &c., now almost extinct.	
Nemeobius Lucina ...	locally common in woods	Jn. 12, O.E.; Jy. 12.

Thecla Betulae	West W., Ramsbury.	
T. W-album	Littlecote,Stype W.,&c.	Jy. 28, N.M., S.P.; Aug. 10.
T. Quercus	very common in woods	Jy. 28, N.M.
T. Rubi	Ramsbury, West W., Rabley W.	My. 25, N.M.; Jn. 19.
Chrysophanus Phlaeas ...	common	Jn. 10, E.G.W.
Polyommatus Argiolus...	common	Aug. 22, N.M.
P. Alsus	Mildenhall, West W., Thrup W.. &c. ...	Jn. 16, O.E.; 29.
P. Arion	near Marlborough; scarce; not lately.	
P. Corydon	common on downs ...	Aug. 8, N.M.
P. Alexis	abundant	Jn. 6, O.E.
P. Agestis	common	Jn. 14, N.M.
Thymele Alveolus	ditto	My. 26, N.M.
Thanaos Tages	ditto	My. 25, N.M.
Pamphila Linea	ditto	Jy. 21, O.E.; Aug. 10.
P. Sylvanus	ditto	Jn. 15, E.G.W.
P. Comma	Forest Hill, Martinsell, common	Aug. 8, N.M.
	SPHINGINA.	
Procris Geryon	Forest Hill, &c.	Jn. 11, N.M.
Anthrocera Lonicerae ...	Eastridge, Bedwyn, &c.	Jy. 10, E.G.W.; 28.
A. Filipendulae	very common	Jy. 10, N.M.; Aug. 8.
Smerinthus Ocellatus ...	not scarce.	
S. Populi	common at light, &c....	Jn. 12, C.M.C.
S. Tiliae	common	Jn. 10, S.P.
Acherontia Atropos ...	occasional.	
Sphinx Convolvuli	ditto.	
S. Ligustri	common	Jy. 11, N.M.
Deilephila Livornica ...	once, Marlborough.	
Chaerocampa Celerio ...	ditto.	
C. Elpenor	scarce, Marlborough...	Jy. 25, N.M.
C. Porcellus	common at flowers ...	Jn. 29, N.M.
Macroglossa Stellatarum	common	Jn. 3, S.V.H.
Sesia Fuciformis	Sav. Forest, West W.,&c.	
S. Bombyliformis	Marlborough.	
Sphecia Bembeciformis...	ditto.	
Trochilium Tipuliforme	common in gardens ...	Jy. 6, S.P.
	BOMBYCINA.	
Hepiatus Heclus	Sav.Forest,Knighton,&c.	Jy. 2, F.J.H.J.

H. Lupulinus	very common	My. 30, N.M.
H. Humuli	not rare	Jy. 20, N.M.
H. Velleda	Manton Copse; scarce	Jn. 28, N.M.
H. Sylvinus	Ramsbury, &c.	Aug. 25, N.M.
Cossus Ligniperda... ...	rather common	Jy. 25, S.P.
Cerura Furcula	not rare.	
C. Bifida	ditto; Ramsbury.	
C. Vinula	rather common	Jn. 13. N.M.
Stauropus Fagi	Sav. Forest, twice.	
Notodonta Ziczac	Marlborough.	
Pterostoma Palpina ...	West W., at light; Marlborough	Jy. 13, N.M.
Drymonia Dodonæa ...	Marlborough; at light, one	Jn. 12, N.M.
Leiocampa Dictæa ...	ditto, scarce.	
L. Dictæoides	Marlborough; at light, one	Aug. 15, N.M.
Lophopteryx Camelina ...	not rare.	
Diloba Caeruleocephala	common	larv., My. 25, N.M.
Petasia Cassinea	Sav. Forest, not scarce	
Peridea Trepida	Marlborough; at light, once.	
Pygaera Bucephala ...	common	My. 15, N.M.
Psilura Monacha	Sav. Forest, &c.; common in woods.	
Dasychira Pudibunda ...	common; at light ...	Jn. 9, O.E.
Demas Coryli	Sav. Forest, scarce.	
Orgyia Antiqua	common	Aug. 22, N.M.
O. Gonostigma	Marlborough?	
Stilpnotia Salicis	rather common	Aug. 8, N.M.—14
Porthesia Auriflua ...	abundant	Jy. 25, N.M.
Miltochrista Miniata ...	Sav. Forest, West W., at light	Jy. 13, N.M.
Lithosia Aureola	Sav. Forest, once.	
L. Complanula	very common	Aug. 10, N.M.
L. Griseola	Ramsbury, Chilton, &c.	Aug. 20, N.M.
var. Stramineola	with the last.	
Oenistis Quadra	Sav. Forest, twice.	
Gnophria Rubricollis ...	Thrup W., Sav. Forest, &c.	Jy. 1.
Cybosia Mesomella ...	near Gt. Bedwyn	

Nudaria Mundana... ...	Ramsbury, &c., not common.	
Euthemonia Russula ...	Sav. Forest, not lately.	
Arctia Caja	abundant	Jy. 25, N.M.; Aug.10.
Nemeophila Plantaginis	locally abundant ...	Jn. 11, N.M.
Phragmatobia Fuliginosa	not common.	
Spilosoma Menthastri ...	abundant	Jn. 13, O.E.; 30.
S. Lubricipeda	ditto	Jn. 18, N.M.; Jy. 10.
Diaphora Mendica... ...	rather common at light	Jn. 14, O.E.
Callimorpha Jacobaeae...	common	Jn.10,T.A.P.; Jy.29.
Lasiocampa Rubi	West W.	
L. Quercus	abundant	Jy.25,N.M.: Aug.15.
Eriogaster Lanestris ...	larvae abundant... ...	larv. Jn. 30, S.P.
Poecilocampa Populi ...	common at light.	
Trichiura Crataegi... ...	Marlborough, not rare.	
Clisiocampa Neustria ...	Ramsbury, &c., not common	Aug. 5.
Odonestis Potatoria ...	abundant	Jy. 24, N.M.; Aug.2.
Gastropacha Quercifolia	common	Aug. 8, N.M.; 17.
Cilix Spinula	ditto	Jn.18, N.M.; Sept. 2.
Platypteryx Lacertinaria	Sav. Forest, Common Frith	Jn. 5, N.M.
Drepana Falcataria ...	Sav. Forest, Henswood, Marlborough	Jn. 14, Aug. 15, N.M.
D. Hamula	Sav. Forest.	
D. Unguicula...	ditto,Stype W.,common	Aug. 3.
Fumea Nitidella	Rabley W., Henswood, common.	
	NOCTUINA.	
Thyatira Derasa	Marlborough, West W., at sugar	Jy. 16, N.M.
T. Batis	West W., at sugar and light	Jy. 13, N.M.
Cymatophora Duplaris...	Boltstridge W., &c.: very common.	
C. Diluta...	Manton Copse.	
C. Or	West W.	Jy. 13, N.M.
C. Flavicornis	Sav. Forest.	
C. Ridens	Manton Copse, scarce.	
Bryophila Perla	very common	Aug. 13, N.M.
B. Glandifera...	Marlborough.	
Acronycta Tridens ...	Chilton, Aldbourne.	
A. Psi	abundant	Jn. 10, S.P.; Jy. 11.

A. Aceris...	Ramsbury, Marlborough	Jy. 15.
A. Megacephala	common on poplars ...	Jy. 15.
A. Almi	Ramsbury, &c.; rare.	
A. Ligustri	common.	
A. Rumicis	West W., &c., rather common	Jy. 10, N.M.; 20.
Leucania Conigera ...	Ramsbury, West W. ...	Jy. 18.
L. Turca ... .:	Sav. Forest, at sugar, common	Jn. 25, N.M.; Jy. 9.
L. Lithargyria	common	Jn. 30, N.M.
L. Comma	Ramsbury, at light ...	Jn. 30.
L. Impura	Ramsbury, &c.	
L. Pallens	abundant	Jn. 30.
Gortyna Flavago	Marlborough, at light.	
Hydraecia Nictitans ...	Poulton.	
H. Micacea	Marlborough, at light.	
Axylia Putris	ditto.	
Xylophasia Rurea	Sav. Forest, West W., common	Jn. 18, N.M.; Jy. 20.
X. Lithoxylea...	common	Jy. 13, N.M.; 20.
X. Polyodon	abundant	Jy. 15, N.M.
X. Hepatica	very common	Jy. 20, N.M,; 29.
Neuria Saponariae ...	Ramsbury, Sav. Forest, &c.	Jn. 26, N.M.
Heliophobus Popularis ...	Marlborough, common at light.	
Cerigo Cytherea	Marlborough, at light, scarce	Aug. 14, N.M.
Luperina Testacea ...	abundant at light ...	Aug. 16, N.M.
L. Cespitis	Marlborough, once.	
Mamestra Anceps ...	West W., at sugar ...	Jy. —, N.M.
M. Brassicae	abundant	Jn. 20, O.E.; Jy. 10.
M. Persicariae	Marlborough.	
Apamea Basilinea... ...	common at light.	
A. Gemina	Ramsbury.	
A. Unanimis	larvae common; Ramsbury, &c.	
A. Oculea	abundant	Jy. 21, N.M.
Miana Strigilis	ditto	Jn. 21, N.M.; Jy. 20.
M. Furuncula...	Ramsbury.	
M. Arcuosa	ditto, local.	
Grammesia Trilinea ...	Marlborough, very common	Jn. 21, N.M.

Caradrina Alsines	Ramsbury, at light ...	Jn. 30.
C. Blanda	ditto, very common.	
C. Cubicularis...	abundant	Aug. 18, N.M.
Rusina Tenebrosa	Ramsbury, Marlborough; light ...	Jn. 19, N.M.
Agrotis Puta	Marlborough, at light.	
A. Suffusa	common at sugar.	
A. Segetum	abundant	Jn. 13, N.M.—Jy. 5.
A. Exclamationis	ditto	Jn. 30, O.E.—Jy. 15.
A. Corticea	Ramsbury, Marlborough; common...	Jn. 29, N.M.
A. Tritici...	Marlborough railway-bank...	Aug. 24, N.M.
A. Aquilina	Thrup W.	
A. Porphyrea	Bedwyn Common.	
Triphaena Ianthina ...	Ramsbury, Marlborough	Jy. 28, N.M.
T. Fimbria	Marlborough, Littlecote	
T. Interjecta	not uncommon.	
T. Orbona	common	Aug. 5, N.M.—Sept. 2.
T. Pronuba	abundant	Jn. 30, O.E.—Aug. 8.
Noctua Augur	common.	
N. Plecta...	Marlborough; sugar...	Jn. 5, N.M.
N. C-nigrum	common	Jy. 20, N.M.
N. Triangulum	Ramsbury, Marlborough	Jy. 18.
N. Rhomboidea	Ramsbury; sugar.	
N. Brunnea	common.	
N. Festiva	abundant	Jn. 18, N.M.; Jy. 13.
N. Bella	common, at light ...	Aug. 14, N.M.
N. Baja	Ramsbury.	
N. Xanthographa	abundant	Aug. 26, N.M.
Trachea Piniperda... ...	Ramsbury Plantation.	
Taeniocampa Gothica ...	very common	Apr. 14, N.M.
T. Rubricosa	Marlborough; at sallows	Apr. 7, N.M.
T. Instabilis	very common	Apr. 5, N.M.
T. Populeti	Marlborough	
T. Stabilis	abundant	Mr. 14, S.P., N.M.
T. Gracilis	Marlborough; light and sallows	Ap. 7, N.M.
T. Miniosa	West W.; at sallows, uncommon	Ap. 10, N.M.

T. Munda	West W., &c.; not rare	Apr. 10, S.P., N.M.
T. Cruda	abundant	Mr.30,N.M.; Apr.30.
Orthosia Lota	Marlborough.	
O. Macilenta	Sav. Forest.	
Anchocelis Pistacina ...	abundant.	
A. Lunosa	ditto, at light.	
A. Litura...	common.	
Cerastis Vaccinii	abundant	Mr. 2 (h), N.M.
C. Spadicea	rather common	Mr. 31 (h), N.M.
Scopelosoma Satellitia ...	common	Mr. 2 (h), N.M.
Dasycampa Rubiginea ...	Marlborough, once.	
Xanthia Cerago	Marlborough, at light.	
X. Flavago	ditto, rather common.	
X. Ferruginea	common.	
Cosmia Trapezina	abundant	Jy.27,N.M.; Aug.26.
C. Diffinis	common.	
C. Affinis...	Ramsbury, not scarce.	
Eremobia Ochroleuca ...	Henswood, Aldbourne, Marlborough.	
Dianthoecia Carpophaga	Ramsbury, Marlborough; at light ...	Jn. 28, 30.
D. Capsincola...	common.	
Hecatera Serena	Loves W., &c., rather common	Jy. 9.
Epunda Lichenea (?) ...	Marlborough ?	
E. Viminalis	West W., at light ...	Aug. 10, N.M.
Miselia Oxyacanthae ...	common.	
Agriopis Aprilina	do.	
Phlogophora Meticulosa	do.	Jn. 8, O.E.
Euplexia Lucipara... ...	Marlborough.	
Aplecta Nebulosa	very common	Jy. 8.
A. Advena	Ramsbury.	
Hadena Protea	rather common.	
H. Dentina	very common	Jn. 18, N.M.; 30.
H. Oleracea	abundant	Jn. 19, N.M.; Jy. 10.
H. Pisi	West W., at sugar ...	Jn. —, N.M.
H. Thalassina...	common.	Jn. 30.
Xylocampa Lithorhiza ...	common.	Apr. 2, N.M.
Calocampa Exoleta ...	not scarce, Marlborough, &c.	
Xylina Rhizolitha	Sav. Forest, on trunks.	
X. Semibrunnea	Axford, Marlborough.	
Cucullia Verbasci	larvae abundant.	

C. CHAMOMILLAE	larva near Bedwyn ...	1875.
C. Umbratica...	common, at flowers &c.	Jy. 2, F.J.H.J.; 12.
Acontia Luctuosa	Marlborough, railway-bank.	
Brephos Parthenias ...	Sav. Forest, common...	Apr. 9, N.M.; 12.
B. Notha...	Henswood, West W., common	Apr. 15, N.M.
Abrostola Urticae	common	Jy. 3, S.P.
A. Triplasia	ditto	Jn. 30.
Plusia Chrysitis	ditto, at light	Jn. 30; Jy. 10.
P. Festucae	Marlborough, not common.	
P. Iota	common, at flowers and light	Jn. 29, N.M.; Jy. 9.
P. Gamma	abundant	Jn. 4.
Gonoptera Libatrix ...	common	Sept. 1.
Amphipyra Pyramidea ...	very common	Aug. 26, N.M.
A. Tragopogonis	common	Aug. —, N.M.
Mania Typica...	ditto.	
M. Maura	ditto	Aug. 2—15.
Toxocampa Pastinum ...	Bedwyn Brails.	
Catocala Nupta	common.	
Euclidia Mi	local; Forest Hill, &c.	Jn. 20, O.E.
E. Glyphica	Savernake, West W.	
Phytometra Aenea... ...	Sav. Forest, common...	Jn. 20, N.M.
	GEOMETRINA.	
Ourapteryx Sambucaria...	common	Jy. 12, S.P.
Epione Apiciaria	rather common.	
Rumia Crataegata... ...	abundant	Jn. 8.
Angerona Prunaria ...	West W., Boltsridge, Henswood	Jy. 13, N.M.
Metrocampa Margaritata	common	Jy. 4, N.M.
Ellopia Fasciaria	Ramsbury, Sav. Forest.	
Eurymene Dolobraria ...	Sav. Forest, &c., not common	Jn. 25, N.M.
Pericallia Syringaria ...	Ramsbury, &c., not common.	
Selenia Illunaria	very common	Apr. 11; My. 10.
S. Lunaria	Manton Copse.	
S. Illustraria	Ramsbury Plantation.	
Odontopera Bidentata ...	common.	
Crocallis Elinguaria ...	ditto.	
Ennomos Tiliaria	ditto.	
E. Fuscantaria	Sav. Forest, Marlborough, &c., common.	

E. Erosaria	Marlborough.
E. Angularia	common ... ... Sept. 2.
Himera Pennaria	Marlborough.
Phigalia Pilosaria	Sav. Forest, &c.
Nyssia Hispidaria	Marlborough, once at light.
Amphidasis Prodromaria	Sav. Forest, Marlborough; uncommon.
A. Betularia	not common.
Hemerophila Abruptaria	common, at light, &c... My. 15, N.M.
Cleora Glabraria	Sav. Forest, Cakewood, Burnt W.
C. Lichenaria	common ... ... Aug. 10, N.M.
Boarmia Repandata ...	ditto ... ... Jy. 26.
B. Rhomboidaria	ditto ... ... Jy. 5; Aug. 20.
B. Roboraria	Puthall W., once.
B. Consortaria	Marlborough, once at light.
Tephrosia Crepuscularia	not common.
T. Laricaria	Stype W., Sav. Forest.
T. Extersaria	Puthall W., common.
Pseudoterpna Cytisaria...	Aldbourne, Sav. Forest.
Geometra Papilionaria ...	Boltsridge W.; uncommon.
Iodis Lactearia	very common ... ... My. 25, N.M.
Phorodesma Bajularia ...	Sav. Forest, West W., at light ... ... Jy. 15, N.M.
Hemithea Thymiaria ...	common ... ... Jn. 7, O.E.; Jy. 30.
Ephyra Porata	ditto
E. Punctaria	Puthall W., West W., &c. Jn. 13, N.M.
E. Trilinearia	Sav. Forest, Ramsbury, common ... ... Jn. 28, N.M.
E. Omicronaria	Puthall W., West W.
E. Pendularia	ditto, ditto.
Asthena Luteata	widely distributed ... Jy. 9.
A. Candidata	abundant ... ... Jn. 12, O.E.
A. Sylvata	Sav. Forest, Manton Copse.
A. Blomeri	Ramsbury Plantation... Jy. 15.
Acidalia Scutulata ...	very common ... ... Jy. 15; Aug. 21.
A. Bisetata	abundant ... ... Jy. 13; Aug. 2.
A. Trigeminata	Marlborough.
A. Virgularia	Ramsbury, &c., common Jy. 30.
A. Subsericeata	Marlborough, once.
A. Remutata	common in woods ... Jn. 30, O.E.
A. Imitaria	not scarce, Ramsbury, &c.
A. Aversata	abundant ... ... Jy. 4, N.M.

Bradyepetes Amataria...	common	Jy. 13—16.
Cabera Pusaria	very common	Jn. 7, O.E.
C. Exanthemata	common	Aug. 18, N.M.
Corycia Punctata	Savernake Forest, &c, common	Jy. 5, N.M.
C. Taminata	Sav. Forest, not common	Jy. 5, N.M.
Aventia Flexula	Knighton, scarce.	
Halia Wavaria	common	Aug. 11, N.M.
Strenia Clathrata	ditto	Jn. 12, N.M.
Lozogramma Petraria ...	Savernake Forest, &c., common	Jn. 9, O.E.
Numeria Pulveraria ...	Boltsridge W., &c., scarce.	
Fidonia Atomaria	common	Jn. 7, N.M.; 20.
F. Piniaria	common among firs.	
Minoa Euphorbiata ...	Rabley W., West W., &c., uncommon.	
Abraxas Grossulariata ...	very abundant	Jy. 26.
A. Ulmata	Binck-knoll, Ramsbury, Marlborough, scarce.	
Ligdia Adustata	common	My. 11; Jn. 28.
Lomaspilis Marginata ...	ditto	Jn. 7, O.E.
Hybernia Rupicapraria...	ditto	Feb. 10, N.M.
H. Leucophearia	ditto.	
H. Aurantiaria	Savernake Forest.	
H. Progemmaria	common	Mr. 20, N.M.
H. Defoliaria	ditto.	
Anisopteryx Aescularia	ditto, at light	Apr. 15, N.M.
Cheimatobia Brumata ...	abundant	Jan. 8, N.M.
Oporabia Dilutata	very common.	
Larentia Didymata ...	common	Jy. 30.
L. Multistrigaria	Sav. Forest, &c., not common	Apr. 28, N.M.
L. Olivaria	Savernake Forest.	
L. Miaria...	very common	Jn. 21; Jy. 6.
Emmelesia Affinitata ...	Binck-knoll, &c., common, locally.	
E. Alchemillata	Henswood, Rabley W.	
E. Albulata	Chisledon, Bedwyn, co mmon.	
Eupithecia Venosata ...	West W., Ramsbury ...	Jn. 27, F.J.H.J.
E. Centaureata	Marlborough, not common	Aug. 16, N.M.
E. Subfulvata...	rather common in gardens.	
E. Plumbeolata	common in woods.	
E. Haworthiata	Mildenhall, Ramsbury, not common	Aug. 2.

E. Castigata	very common	Jn. 4, N.M.
E. Lariciata	local; Ramsbury, Binck-knoll.	
E. Irriguata	Sav. Forest, once on fence.	
E. Nanata	Marlborough, at light, once.	
E. Subnotata	common	Jy. 22.
E. Vulgata	abundant at light ...	Jn. 3, N.M.; 30.
E. Assimilata	common in gardens ...	Jn. 28.
E. Subciliata	Littlecote Park, once.	
E. Dodoneata	Sav. Forest, scarce.	
E. Abbreviata	common	My. 16, N.M.
E. Exiguata	ditto.	
E. Togata	Marsden.	
E. Pumilata	not common.	
E. Coronata	Ramsbury, scarce.	
E. Rectangulata	very common	Jn. 30; Jy. 10.
Lobophora Viretata ...	Sav. Forest, once.	
L. Lobulata	Sav. Forest, not scarce	My. 14, N.M.
Thera Variata	common	Jn. 28, N.M.
T. Firmaria	Chilton, Ramsbury Plantation.	
Ypsipetes Elutata	very common	Aug. 18; Sept. 2.
Melanthia Rubiginata ...	Sav. Forest, Boltsridge,	Jy. 16.
M. Ocellata	common	Jn. 7, O.E.
M. Albicillata	Henswood, Rabley W., Ramsbury, &c. ...	Jy. 15.
Melanippe Hastata ...	Puthall W., West W., not scarce.	
M. Procellata	Manton Copse, uncommon.	
M. Unangulata	not rare	Jy. 13.
M. Rivata	scarce	
M. Biriviata	very common	Jy. 13.
M. Montanata	abundant	Jn. 4; Jy. 2.
M. Fluctuata	very abundant	My. 7, N.M.
Anticlea Rubidata... ...	Ramsbury, Marlborough, West W....	Jn. 28; Jy. 10.
A. Badiata	common	Apr. 30; My. 18.
A. Derivata	ditto	My. 11, N.M.; 30.
Coremia Propugnata ...	Sav. Forest, uncommon	
C. Ferrugaria...	abundant	My. 11.
C. Unidentaria	very common	Jn. 26, N.M.
Camptogramma Bilineata	abundant	Jn. 28, O.E.
C. Fluviata	Marlborough, one at light...	My. 12, N.M.

Phibalapteryx Tersata ...	common near Clematis.	
P. Lignata	Marlborough, rather common	
P. Vitalbata	Ramsbury,not common	
Scotosia Dubitata	common.	
S. Vetulata	rather common	Aug. 7, N.M.
S. Rhamnata	Knighton, &c, rather common	Aug. 3
S. Certata	Marlborough.	
Cidaria Miata...	very common.	
C. Picata...	rather common in woods	Jn, 30, O.E.
C. Corylata	ditto	My. 17, N.M.
C. Russata	very common	Aug. 30.
C. Immanata	ditto	Aug. 5, N.M.
C. Suffumata	Marlborough.	
C. Silaceata	Pewsey.	
C. Prunata	Ramsbury, Marlborough	Jy.; N.M.
C. Testata	Marlborough.	
C. Fulvata	common	Jy. 6; 15
C. Pyraliata	ditto	Jy. 13; Aug. 15
C. Dotata	ditto in gardens ...	Jn. 30; Jy. 17
Eubolia Cervinata... ...	Marlborough, at light.	
E. Mensuraria	common, Martinsell, &c.	
E. Plumbaria	abundant	Aug 3; 28
E. Bipunctaria	common on downs ...	Aug. 7, N.M.
E. Lineolata	Marlborough Downs, &c., common.	
Anaitis Plagiaria	common	Aug. 23.
Chesias Spartiata	Marlborough, at light.	
Odezia Chaerophyllata ...	Sav. Forest, Knighton, &c., abundant... ...	Jn. 25, N.M.; Jy. 9.
	PYRALIDINA.	
Hypena Proboscidalis ...	very common	Jy. 3, 19.
H. Rostralis	common in spring ...	Mar. 24.
Rivula Sericealis	Bedwyn,Boltaridge,&c. common	Jy. 26.
Herminia Barbalis... ...	West W., Puthall W.	
H. Tarsipennalis	common.	
H. Nemoralis	West W., &c.	
Pyralis Farinalis	Marlborough.	

Aglossa Pinguinalis ...	abundant	Jn. 25.
Pyrausta Punicealis ...	Marlborough Downs.	
P. Purpuralis...	Sav. Forest, &c.; common	Jn. 10, N.M.
P. Ostrinalis	ditto, more common...	Jn. 4.
Herbula Cespitalis... ...	very common	My.26,N.M.; Jy. 11.
Ennychia Anguinalis ...	West W.	
Cataclysta Lemnata ...	Marlborough.	
Paraponyx Stratiotata...	ditto, at light	
HydrocampaNymphaeata	Binoknoll,Chisledon,&c.	Jy. 12.
H. Stagnata	common.	
Acentropus Niveus ...	near Martinsell, once.	
Botys Pandalis	Rabley W., Sav. Forest	
B. Verticalis	abundant	Jy. 30.
B. Fuscalis	very common	Jn. 29.
B. Urticata	common	Jy. 3.
Ebulea Crocealis	Sav. Forest, Bedwyn.	
E. Sambucalis	common	Jn. 30; Aug. 4.
Pionea Forficalis	very common	Jn. 30.
Spilodes Cinctalis	common.	
Scopula Lutealis	very common	Jy. 30.
S. Olivalis	abundant	Jn. 28; Aug. 3.
S. Prunalis	ditto	Jy. 16; Aug. 4.
S. Ferrugalis	Henswood, Boltsridge W., not common ...	Aug. 30.
Stenopteryx Hybridalis...	common	July 12—31.
Nola Cucullatella	Chilton, Sav. Forest, Marlborough	Aug. 4, N.M.
N. Cristulalis	Marlborough, Puthall W.	
Simaethis Fabriciana ...	very abundant	My 7; Jy. 2; Sept. 1.
Choreutes Scintillulana...	Chilton.	
Eudorea Cembrae	Ramsbury, at light ...	Jn. 30.
E. Ambigualis	abundant	Jn. 5; Jy. 10.
E. Pyralella	common	Jn. 23.
E. Crataegella	rather common	Jy. 25.
E. Frequentella	common	Jy. 16.
E. Resinea	Knighton, Boltsridge, not rare	Jy. 7.
E. Angustea	Marlborough, at light.	
Aphomia Colonella ...	common at light ...	Jn. 27; Aug. 18.
Achroia Grisella	Marlborough, Ramsbury.	

Ephestia Elutella	Marlborough, Ramsbury	Jn. 29.
Homoeosoma Nebulella...	Ramsbury, not scarce	Jy. 16.
H. Binaevella...	Marlborough, Ramsbury.	
Acrobasis Consociella ...	Thrup W.	
A. Tumidella	Henswood, Thrup W., &c., common	Jy. 28.
Cryptoblabes Bistriga ...	Boltsridge W., scarce.	
Myelois Cirrigerella ...	Ramsbury, at light, scarce.	
Nephopteryx Roborella...	Bedwyn, Boltsridge, &c., common	Jy. 13; bred, Aug. 3, N.M.
Crambus Chrysonuchellus	Sav. Forest, locally abundant...	Jn. 15.
C. Falsellus	Ramsbury, thatch.	
C. Pratellus	abundant	Jn. 22; Jy. 11.
C. Pascuellus	local; Chisbury, Bedwyn, &c.	
C. Hortuellus	abundant	Jn. 25; Jy. 10.
C. Culmellus	ditto	Jy. 10; Aug. 26.
C. Inquinatellus	common	Jy. 30; Aug. 11.
C. Genioulens	ditto	Aug. 16, N.M.
C. Selasellus	Knighton, Marlborough.	
C. Tristellus	very common	Aug. 18.
C. Pinetellus	Marlborough Railway, Stype W., &c, ...	Aug. 3—21.
C. Perlellus	Ramsbury, Bedwyn Brails, &c.	
Chloephora Prasinana ...	common	
C. Quercana	Sav. Forest, &c., not common.	
	TORTRICINA.	
Hypermecia Augustana	common	
Eulia Ministrana	ditto	Jn. 1
Antithesia Corticana ...	Henswood, scarce,	
A. Betuletana...	West W., Stype W., &c., common.	
A. Capraeana...	Puthall W.	
A. Ochroleucana	rather common	Jy. 10; Aug. 2.
A. Cynosbatella	common	Jy. 7; 28.
A. Pruniana	abundant	Jn. 19; Aug. 3.
A. Marginana	Bedwyn, Manton W., &c., scarce	
A. Gentianana	Bedwyn, Mildenhall.	
A. Ustulana	Thrup W., Rabley W., Loves W....	Jn. 28; Jy. 15.

Tortrix Viridana	abundant	Jy. 2; Aug. 3.
T. Forsterana	Ramsbury,&c.,common	Jy. 8; 13.
T. Heparana	common	Aug. 3; 12.
T. Ribeana	ditto	Jy. 11; Aug. 3.
T. Corylana	less common.	
Lozotaenia Sorbiana ...	Rabley W., Loves W., &c, common	Jy. 2, F.J.H.J.; 10.
L. Musculana	common.	
L. Costana	Knighton.	
L. Unifasciana	very common	Jy. 3; 27.
L. Fulvana	common	Jy. 10; 27.
L. Roborana	Stype W., Loves W., Thrup W.	Aug. 3.
L. Xylosteana...	very common	Jy. 13; Aug. 8.
L. Rosana	abundant	Jy. 10; Aug. 10.
Ditula Angustiorana ...	very common	Jn. 29; Aug. 8.
Ptycholoma Lecheana ...	common.	
Notocelia Udmanniana...	rather common	Jy. 27; Aug. 3.
Pardia Tripunctana ...	common	Jn. 27; Jy. 6.
Spilonota Roborana ...	ditto	Jy. 3; 15.
S. Rosaecolana	not rare, Ramsbury ...	Jy. 24.
S Trimaculana	rather common	Jy. 10.
LithographiaCampoliliana	common	Jn. 22; 30.
L. Nisella	common, West W., &c.	
L. Penkleriana	very common	Jy. 3.
Phlaeodes Tetraquetrana	Bedwyn, West W., Puthall W.	Apr. 23.
Poedisca Piceana... ...	Boltsridge W.	Jy. 30.
P. Solandriana	common	Sept. 1.
P. Ophthalmicana	Thrup W.,not common.	
Catoptria Scopoliana ...	Ramsbury, Rabley W...	Jy. 2, F.J.H.J.
C. Fulvana	Ramsbury, local.	
C. Hohenwarthiana ...	Thrup W., Bedwyn,&c., common	Jn. 29; Aug. 3.
Halonota Bimaculana ...	Bedwyn, West W., Henswood.	
H. Cirsiana	Bedwyn Brails	Jn. 5, N.M.
H. Scutulana	Marlborough railway-bank, &c.	
H Brunnichiana	common	Jn. 27.
H Tetragonana	Thrup W., Puthall W., &c., not rare.	
Dichrorampha Petiverella	common	Jy. 24; Aug. 3.
D. Sequana	Bedwyn.	

D. Politana	Stype W., Aldbourne, Ramsbury, &c. ...	Jy. 24.
D. Simpliciana	Cakewood.	
D. Plumbagana	very common	Jn. 29; Jy. 4.
D. Consortana...	Bedwyn Brails.	
Coccyx Hyrciniana... ...	very common	Jn. 15.
Cartella Bilunana	West W.	
Hedya Paykulliana... ...	Henswood.	
H. Ocellana	very common	Jy. 13; Aug. 8.
H. Dealbana	ditto	Jy. 13; Aug. 15.
H. Neglectana	Ramsbury, common ...	Jy. 5, 15.
H. Trimaculana	very common	Jy. 5, 27.
Steganoptycha Naevana..	ditto	Jy. 30.
Anchylopera Mitterbacheriana	Henswood, Rabley W., scarce.	
A. Diminutana	Knighton, Boltsridge W., scarce.	
A. Lundana	very common	My.25, N.M.; Aug.3,10.
A. Derasana	Rabley, Knighton, not common.	
A. Comptana	Everleigh Downs.	
Bactra Lanceolana... ...	very common	Jn. 20; Aug. 25.
B. Furfurana	Ramsbury, Bedwyn; at light	Jy. 10, 15.
Argyrotoza Conwayana	abundant	Jy, 3; Aug. 3.
Dictyopteryx Contaminana	ditto	Aug. 30.
D. Loeflingiana	ditto	Jy. 13; Aug. 3.
Croesia Bergmanniana...	ditto	Jy. 1; Aug. 4.
C. Forskaleana	ditto	Aug. 3; 18.
C. Holmiana	common	Jy. 30; Aug. 15.
Hemerosia Rheediella ...	Mildenhall, Sav. Forest, &c., common	Jn. 9.
Oxygrapha Literana ...	Sav. Forest, Rabley, &c, common.	
Peronea Schalleriana ...	Bedwyn, Rabley W., Henswood.	
P. Comparana	very common	Aug. 28.
P. Tristana	Boltsridge W., Mildenhall, &c.	
P. Rufana	Aldbourne Gorse.	
P. Favillaceana	very common.	
P. Hastiana	Marlborough, Aldbourne Gorse, common.	
P. Variegana	very common	Jy. 30.
Paramesia Aspersana ...	Stype W., Thrup W., &c., very common.	
Teras Caudana	Manton Copse, Bedwyn	
Poecilochroma Profundana	common.	
P. Corticana	very abundant	Jy. 27.

P. OPPRESSANA	Ramsbury, on poplars, common ... ... July 7; 20.
Anisotaenia Ulmana ...	Blakes W., Littlecote, &c.
Roxana Arcuella	West W., Rabley, Thrup W., &c. ... ... Jn. 3.
Semasia Spiniana	Rabley Lane, Knighton, &c.
S. Woeberana	Ramsbury ... ... Jy. 1; 10.
S. Janthinana	ditto, not common.
S. Rufillana	Bedwyn Brails.
S. Nanana	Blakes W., Ramsbury Plantation, &c.
Eucelis Aurana	Knighton, Boltsridge W Jy. 13.
Ephippiphora Argyrana	not very common.
E. Nigricostana	Savernake, Axford, Knighton, &c.... ... Jy. 2.
Stigmonota Nitidana ...	Thrup W.
S. Compositella	Ramsbury, &c., common Jy. 8; Aug. 15.
S. Perlepidana	generally common ... My. 21; 30.
Asthenia Splendidulana	Sav. Forest, Henswood
Retinia Buoliana	Eastridge.
R. Pinivorana...	Sav. Forest, Eastridge, common.
R. OCCULTANA...	Boltsridge; not common ... ... Jy. 13, 16.
Endopisa Proximana ...	Knighton, Binok-knoll, &c. Jn. 29.
Carpocapsa Juliana ...	Sav. Forest.
C. Splendana	Thrup W., Sav. Forest, &c.
C. Grossana	Thrup W., &c., not scarce Jn. 30, F.J.H.J.
C. Pomonella	Ramsbury.
C. Funebrana...	Ramsbury, not common.
Grapholita Albersana ...	Puthall W., West W., &c.
G. Ulicetana	abundant ... ... My. 9.
G. Hypericana	very common ... ... Jn. 28; Jy. 7.
Cnephasia Hybridana ...	very common ... ... Jn. 26; Jy. 14.
C. Subjectana	abundant ... ... Jn. 25; Jy. 10.
C. Virgaureana	ditto .. .. Jn. 28; Aug. 3.
C. Alternella	common ... ... Aug. 3, 8.
C. Nubilana	Ramsbury, local.
Ablabia Pratana	Aldbourne Downs.
Euchromia Striana ...	very common ... ... Jy. 30; Aug. 3.
Orthotaenia Antiquana ..	Ramsbury, in a marsh.
Sericoris Lacunana ...	abundant ... ... Jn. 26; Jy. 20.
S. Urticana	common ... ... Jy. 2, F.J.H.J.

Lobesia Reliquana... ...	common in woods.	
Chrosis Tesserana	very common	Jn. 30; Jy. 12.
ArgyrolepiaSubbaumanniana	Aldbourne, Martinsell; on downs	Jy. 12.
A. Badiana	Ramsbury Plantation.	
A. Cnicana	rather common in woods.	Jn. 28, N.M.; Jy. 5.
Eupoecilia Maculosana...	Manton, Boltsridge W., common.	
E. Nana	Ramsbury.	
E. Angustana...	common	Jn. 29; Jy. 18.
E. Manniana	not at all scarce	Jy. 5, 16.
E. Rupicola	West W., Knighton, common locally ...	Jn. 30, F.J.H.J.
E. Roseana	Bedwyn Brails.	
E. Ruficiliana...	Henswood, Forest Hill	My. 26.
Lozopera Dilucidana ...	Bedwyn Brails.	
L. FRANCILLANA	Eastridge, scarce ...	Jy. 11.
Xanthosetia Hamana ...	very common	Jn. 25; Aug. 3.
X. Zoegana	Loves W., Rabley, scarce.	
Tortricodes Hyemana ...	abundant	Mr. 28; Apr. 10.
	TINEINA.	
ChimabachePhryganella	Thrup W., Marlborough.	
C. Fagella	very common	Ap. 4, 29.
Semioscopis Avellanella...	Ramsbury Park.	
S. STEINKELLNERIANA ...	Sav. Forest...	Apr. 29.
Talaeporia Pseudobombycella	cases in Sav. Forest.	
Xysmatodoma Melanella..	Sav. Forest, Ramsbury	Jy. 7.
Tinea Rusticella	common	My. 25.
T. Tapetzella	Marlborough, Ramsbury.	
T. Arcella	rather common	Aug. 30.
T. Cloacella	common	Jn 30.
T. MISELLA	Marlborough	Jy. 15.
T. Fuscipunctella	ditto.	
T. Pellionella	abundant	Jy. 10; Aug. 2.
T. Lapella	common.	
T. Semifulvella	not scarce	Jy. 5.
LamproniaQuadripunctella	Manton, rather common.	
L. Praelatella...	Rabley, Loves W., &c..	Jy. 2, F.J.H.J.
L. Rubiella	rather common.	
Incurvaria Masculella ...	common	My. 18, 23.
Nemophora Swammerdammella	ditto	My. 26; Jn. 8.

N. Schwarziella	ditto	My. 30; Jn. 8.
N. Metaxella	Ramsbury Plantation.	
Adela Fibulella	rather common.	
A. Degeerella	common in woods.	
A. Viridella	abundant	My. 19, 31.
Nemotois Scabiosellus ...	Thrup W.	
Micropteryx Calthella ...	abundant	My. 19; Jn. 29.
M. Aruncella	Marlborough.	
M. Sappella	abundant	Jn. 8, 16.
M. Mansuetella	Chilton, scarce	My. 25.
M. Thunbergella	very common in woods	My. 11, 26.
M. Purpurella	Loves W., Henswood, &c., common	Apr. 22, 29.
M. Salopiella	Loves W.	
M. Semipurpurella ...	Henswood, Loves W., &c., common	Apr. 22, 30.
M. Unimaculella	Manton W., Henswood, &c., not common ...	Apr.10,N.M.; My.10.
M. Fastuosella	Manton Copse.	
M. Subpurpurella	abundant	My. 7, 26.
Swammerdamia Apicella	rather common	
S. Caesiella	abundant	Jn. 29; Aug. 3.
S. Griseocapitella	Puthall W., not common	My. 23.
S. Lutarea	common generally ...	Jy. 10; Aug. 2.
S. Pyrella	not very common ...	My. 14, 18.
Hyponomeuta Plumbellus	very common	Aug. 3, 30.
H. Padellus	common	Aug. 3, 25.
H. Evonymellus	ditto	Aug. 6, 30.
Anesychia Decemguttella	locally common	bred. Jn. 27; Jy. 5.
Prays Curtisellus	common	Jn.30,F.J.H.J.; Jy.11.
Plutella Cruciferarum ...	abundant	Jy. 27.
P. Porrectella	Marlborough.	
Cerostoma Sequella ...	Ramsbury.	
C. Vittella	common.	
C. Radiatella	abundant	Aug. 3.
C. Costella	common	Jy. 27; Aug. 14.
C. Sylvella	Chisledon, &c., common.	
C. Alpella	Sav. Forest, Thrup, Henswood, &c.	
C. Horridella	Knighton, scarce.	
C. Scabrella	Sav. Forest, scarce.	
C. Xylostella	common	Jy. 27; Aug. 10.

Theristis Caudella... ...	Ramsbury, West W....	Mr. —, N.M.
Phibalocera Quercana ...	very common	Jy. 13; Aug. 15.
Depressaria Costosa ...	common	Aug. 28.
D. Liturella	Rabley Lane, &c.	
D. Assimilella	Martinsell.	
D. Atomella	ditto.	
D. Arenella	abundant.	
D. Propinquella	common	My. 7, N.M.
D. Subpropinquella ...	abundant	Mr. 28.
D. Alstroemeriana... ...	not common.	
D. Purpurea	abundant	Mr. 28; Ap. 30.
D. Hypericella	Rabley W., Bedwyn Brails.	
D. Conterminella	Marlborough.	
D. Ocellana	Axford...	Feb. 28. N.M.
D. Yeatiana	Ramsbury, Axford.	
D. Applana	abundant	Jan.27,N.M.; Mr.30.
D. Ciliella	common.	
D. Pimpinellae	Axford, Marlborough, &c.	
D. Albipunctella	very common	Aug. 30.
D. Chaerophylli	Axford, Marlborough.	
D. Ultimella	Ramsbury, &c., common.	
D. Nervosa	Axford, Marlborough, &c.	
D. Pastinacella	Ramsbury, scarce.	
D. Heracliana	very common	My. 8, N.M.
Gelechia Cinerella	Henswood, Rabley W., Stype W.	Aug. 3.
G. Rufescens	generally distributed.	
G. Populella	Ramsbury, Bedwyn, &c.	
G. Ericetella	West W., very common.	
G. Mulinella	Clench Common.	
G. Sororculella	Ramsbury.	
G. Terrella	abundant	Jn. 20; Jy. 28.
G. Acuminatella	Ramsbury, Rabley, &c.	
G. Affinis	abundant in thatch.	
G. Domestica	ditto	Jy. 1; Aug. 2.
G. Proximella...	West W., Bedwyn Brails, common.	
G. Notatella	West W., &c., common.	
G. Vulgella	Sav. Forest, &c., scarce.	
G. Luculella	Henswood, West W.	
G. Fugitivella	Marlborough.	
G. Maculea	common	Jy. 27.

G. Tricolorella	ditto.	Jy. 30.
G. Sequax	Rabley, Thrup W., common.	
G. Albiceps	Henswood.	
G. Dodecella	Eastridge.	
G. Triparella	Ramsbury, Manton W.	
G. Tenebrella...	Chisbury, Eastridge, Boltsridge	Jn. 30,F.J.H.J.; Jy. 5
G. Ligulella	Bedwyn Brails.	
G. Taeniolella...	Marlborough.	
G. Anthyllidella	ditto, Thrup W., &c. ...	Jy. 11.
G. Atrella	Boltsridge, Bedwyn, Rabley, &c.	Jy. 27.
G. Bifractella	Stype W.	
G. Gemmella	Stype,Henswood, Loves W., &c.	
G. Naeviferella	Marlborough, Axford.	
Chelaria Hubnerella ...	common.	
Anarsia Spartiella	Burridge Heath.	
Sophronia Parenthesella	Henswood.	
Harpella Geoffrella ...	Rabley, Henswood, &c., common	Jn. 25.
Dasycera Sulphurella ...	Ramsbury, Sav. Forest, &c., common	My. 20; Jn. 24.
Oecophora Flavimaculella	Rabley W.	
Oe. Tinctella	common in woods ...	Jn. 30, F J.H.J.
Oe. Fuscescens	Ramsbury,Marlborough	Aug. 5, N.M.
Oe. Pseudospretella ...	abundant	Jn. 3.
Endrosis Fenestrella ...	ditto	My. 10.
Butalis Fusco-aenea ..	Thrup W., common ...	Jn. 30,F.J.H.J.; Jy. 5
B. Senescens	BedwynBrails,ThrupW	Jy. 2.
Pancalia Latreillella (?)	Rabley W.	
P. Lewenhoekella	WestW.,Eastridge, &c., common	My. 30; Jn. 30.
Glyphipteryx Fuscoviridella	abundant	Jn. 4—15.
G. Cladiella	Knighton, common ...	Jn. 30, F.J.H.J.
G. Thrasonella	ditto.	
G. Equitella	Fyfield, Hungerford.	
G. Fischeriella	very common	Jn. 10, N.M.; 29.
Perittia Obscurepunctella	Henswood, Manton W., not scarce	My. 6—10.
Antispila Pfeifferella ...	common	My. 11—31.
Tinagma Sericiellum ...	ditto	My. 11—25.

T. Resplendellum	Bedwyn Brails.	
Argyresthia Ephippella	Rabley W., Thrup W., very common.	
A. Nitidella	abundant	Jy. 13; Aug. 30.
A. Semitestacella	Bedwyn, Cakewood, Ramsbury, &c. ...	Aug. 30.
A. Albistria	abundant	Jn. 29.
A. Semifusca	Marlborough, Ramsbury.	
A. Mendica	common	Jy. 3.
A. Retinella	Bedwyn Brails.	
A. Dilectella	Everleigh Downs, common	Jy. 28.
A. Curvella	Binck-knoll, common.	
A. Pygmaecella	Ramsbury, Bedwyn Brails.	
A. Goedartella	abundant	Aug. 8—15.
A. Brockeella	Rabley W., Loves W.	
Cedestis Farinatella ...	Eastridge.	
Oenerostoma Piniariella	ditto	
Zelleria Insignipennella	Ramsbury Plantation	My. 10.
Gracilaria Swederella ...	common	My. 21; Jn. 5.
G. Stigmatella	ditto.	
G. Elongella	Sav. Forest, Cakewood.	
G. Tringipennella	Ramsbury, Marlborough, common	Jn. 27—29.
G. Syringella	abundant	My. 24; Jn. 2.
G. Auroguttella	common	My. 11.
Coriscium Brongniardellum	Ramsbury	
C. Sulphurellum	Sav. Forest	
Ornix Avellanella	abundant	My. 17; Jn. 15.
O. Anglicella	ditto	My. 5—30.
O. Betulae	Sav. Forest, Chisbury W	My. 24.
O. Torquillella	Marborough, Ramsbury	
O. Guttea	Mildenhall, Ramsbury.	
Coleophora Laricella ...	abundant	Jn. 25—30.
C. Solitariella	Sav. Forest, Ramsbury, not common.	
C. Lutipennella	common	Jy. 27.
C. Fuscedinella	abundant	
C. Viminetella	Manton W., Rabley W., Boltsridge W.	
C. Siccifolia	Knighton, Boltsridge.	
C. Gryphipennella	rather common	Jy. 5.
C. Nigricella	common on birch, &c.	
C. Albitarsella	Rabley, West W., &c., scarce.	
C. Aloyonipennella ...	Bedwyn Brails, Ramsbury.	

C. Fabriciella...	Ramsbury, at light.
C. Palliatella	Thrup W., Littlecote W. ... ... Aug. 8.
C. Lixella	Marlborough.
C. Discordella	Rabley Lane.
C. Therinella	Ramsbury.
C. Troglodytella	Knighton.
C. Argentula	Mildenhall, Knighton, &c.
C. Annulatella	Boltsridge, &c.
C. Murinipennella	Puthall W., Crofton, &c., very common.
C. Caespititiella	common ... ... Jn. 30, F.J.H.J.
Batrachedra Piniciolella	Blakes W.
Oinophila V.-flava... ...	Ramsbury.
CHAULIODUS CHAEROPHYLLELLUS...	Axford, Aldbourne, common ... ... My. 7.
Laverna Lacteella... ...	Beltsridge W.
L. Miscella	Loves W., Thrup W.... Jn. 29; Jy. 4.
L. Epilobiella...	abundant ... ... Mr. 28.
L. Phragmitella	Chilton, Knighton, very common.
L. Decorella	Ramsbury, Mildenhall, &c., common ... ... Mr. 28.
L. Subbistrigella	Ramsbury.
L. Atra	Ramsbury.
Chrysoclista Flavicaput	Marlborough, Chiseldon, &c.
ASYCHNA MODESTELLA ...	Henswood ... ... Jn. 4.
Chrysocorys Festaliella	generally distributed.
Stephensia Brunnichella	Mildenhall, Thrup W., common ... ... Jn. 29.
Elachista Magnificella ...	Rabley W.
E. Gleichenella	Eastridge.
E. Albifrontella	common in woods.
E. Cinereopunctella ...	Ramsbury.
E. Luticomella	Rabley, Thrup W., Manton, &c. ... ... Jn.30,F.J.H.J.; Jy.3.
E. Atricomella	rather common ... ... Jn. 29.
E. Nigrella	abundant ... ... My. 7; 31.
E. Bedellella	common on downs.
E. Obscurella...	abundant ... ... My. 19; Jn. 1.
E. Subnigrella	Boltsridge W.
E. Megerlella...	Boltsridge, Rabley, &c.
E. Zonariella	Rabley, Manton W., Boltsridge.

E. Gangabella	Eastridge.	
E. Biatomella...	Sav. Forest, &c.	
E. Triatomea	Rabley, Knighton, &c., common	Jn. 27; Jy. 10.
E. Pollinariella	Rabley W.	
E. Rufocinerea	abundant	My. 19; 29.
E. Cygnipennella	ditto	Jn. 25; Jy. 18.
E. sp. — ?	vid. not	Jy. 2, F.J.H.J.
Tischeria Complanella ...	very common	Jy. 3.
T. Marginea	common	Jy. 16; 27.
Lithocolletis Sylvella ...	ditto	Apr. 30; Jn. 4.
L. Cramerella	very abundant	My. 5, N.M.; Jn. 10.
L. Heegeriella	Loves W., Chisbury W., common	My. 28; 28.
L. Alnifoliella	Bedwyn, common.	
L. Lautella	Pewsey.	
L. Ulmifoliella	Henswood, Sav. Forest Bedwyn	Apr. 24; My. 23.
L. Spinolella	Chiseldon.	
L. Salicicolella	Stype W.	
L. Pomifoliella	abundant	Apr. 11; My. 31.
L. Spinicolella	common	My. 11; 23.
L. Faginella	abundant	Apr. 29; Jn. 4.
L. Coryli...	very common	My. 22; 31.
L. Lantanella...	Mildenhall, Knighton,&c., common	
L. Quercifoliella	abundant	My. 6; Jn. 10.
L. Messaniella	Chilton, ditto	My. 25; Jn. 10.
L. Viminiella	Axford.	
L. Nicellii	Loves W., Blakes W., Axford, &c.	
L. Schreberella	Mildenhall, Chilton, &c.	
L. Emberizaepennella ...	Puthall W.	
L. Tristrigella	Marlborough, &c.	
L. Trifasciella	common	My. 22; Jn. 3.
Lyonetia Clerckella ...	Ramsbury.	
Phyllocnistis Suffusella	abundant	Mr. 28; Jy. 7; 15.
P. Saligna	ditto.	
Cemiostoma Laburnella..	abundant in gardens...	My. 31; Jn. 8.
BuculatrixAurimaculella	Bedwyn Brails, Marlborough.	
B. Crataegi	Marlborough.	
Nepticula Atricapitella...	common	My. 26; Jn. 11.
N. Ruficapitella	ditto.	

N. Pomella	Ramsbury.	
N. Oxyacanthella	Marlborough.	
N. Viscerella	ditto.	
N. Anomalella	Ramsbury, Marlborough, &c.	bred, Aug. 4, 8.
N. Catharticella	Ramsbury, very common	bred, Jn. 8, 25.
N. Septembrella	Rabley W., Cakewood.	
N. Headleyella	Thrup W.	Jy. 2.
N. Subbimaculella... ...	very common	Jn. 15, 29.
N. Salicis...	Stype W., Blakes W., &c.	
N. Floslactella	very common	My. 4, 26.
N. Luteella	Henswood.	
N. Angulifasciella	Ramsbury, &c., common	Jy. 5.
N. Microtheriella	common.	
N. Betulicola	Puthall W.	
N. Plagicolella	Rabley Lane, &c.	
N. Tityrella	Sav. Forest, very common	My. 23, 31.
N. Gratiosella	Axford, abundant ...	My. 7.
N. Marginicolella	Marlborough, Ramsbury.	
N. Aurella	abundant.	
	PTEROPHORINA.	
Pterophorus Trigonodactylus	Marlborough railway-bank.	
P. Acanthodactylus ...	Rabley, Boltsridge.	
P. Phaeodactylus	Chilton, Eastridge, Bedwyn, &c.	Jy. 11, 18.
P. Bipunctidactylus ...	Thrup W., &c.	
P. Fuscus	abundant	Jy. 12, 25.
P. Pterodactylus	ditto.	
P. Microdactylus	West W.	
P. Galactodactylus... ...	common.	
P. Tetradactylus	Common Frith.	
P. Pentadactylus	abundant	Jy. 8, 25.
Alucita Polydactyla ...	very common	My. 5, 26; Jy. 31.

NOTES.

Colias Edusa.—Has occurred here this season, as all over England, in extraordinary profusion, and considerably before its usual time. The reason of this periodicity is at present a matter of mere conjecture; it is thought that its unusual abundance may perhaps be due to the larvae having survived the remarkably mild winter. The variety Helice has been taken with the ordinary form.

Pieris Rapae.—The first notice of this (Apr. 1) was clearly a straggler, tempted out by the two or three sunny days which occurred at that period; I did not observe a second specimen until more than a month afterwards, during which time the continual east winds retarded the appearance of this, as well as several other species.

Platypteryx Falcula.—Mr. N. Manders took several specimens of the second brood at light in the town.

Euthemonia Russula.—Some years ago this was certainly rather common in the Forest, but no specimens have been captured within the last eight years.

Hedya Neglectana.—I took this species rather commonly on the trunks of black poplars, whence I had at first mistaken it for *Aceriana*; the habitat is singular, but it may have come from some not very remote willows.

Stigmonota Internana.—I have ventured to remove this from our lists, feeling sure that Mr. Stainton must have made a slip of the pen in inserting it; it is a very unlikely insect to occur, and it can serve no purpose to retain names without adequate confirmation. I have in this list removed one or two other doubtful species in the same way, but without any note of the fact.

Elachista sp—?—When in company with me in Thrup Wood on July 2nd, Mr. F. J. H. Jenkinson took an *Elachista* allied to *Paludum*, and probably new to Britain, but as it has not yet been determined, I cannot speak definitely at present.

THE Committee have much pleasure in appending the following interesting paper by F. E. THOMPSON, ESQ., which came too late for insertion after the Report of the Meeting at which it was read.

ON THE ENGLAND OF SHAKSPERE'S TIME.

I must begin with a justification. I can well imagine the title of the paper which I propose to read this evening provoking the inquiry which greeted the introduction of new subjects into the early Greek drama: "What has this to do with Dionysus?" What has Shakspere and Shakspere's England to do with the Natural History Society? The reply is not far to seek. This Society of which we are members, is not only concerned with *Scientia Naturalis*, but also affects *quasdam alias res*, and among these latter Archaeology, liberally interpreted, has long held an acknowledged place.

Any one familiar with the M.C.N.H.S. reports, that is to say at least every member of the Society, has but to turn to that long row of volumes which, as we have just heard from our President, now hold their place in the national libraries of the United States, and the New Zealand Colonies, in order to find interspersed amongst papers on the Spectrum Analysis, and the Transit of Venus, and the Moon, and Glaciers, and the Potato, essays on the Wansdyke, and Wiltshire Churches, and Coins, and papers on Heraldry, the latter I need not say by whom, written with the pen of a Gwillim, and illustrated with the pencil of a Memling. With Shylock, but more politely, may I not ask, "Are you answered yet?" May I not assume the legitimacy of my subject, and commence?

And first I wish to say what I am going to speak to you about this evening. The title is an ambitious one, and may prove to be a bush hung out to advertise poor wine. My chief object is to give you an account of an exceedingly interesting reprint of a description of English life written in the reign of Elizabeth. The title of this book is "A description of England, or a briefe rehersall of the nature and qualities of the people of England, and such commodities as are to be found in the same, comprehended in two books, and written by W. H. that is William Harrison, B.D., Cambridge, Rector of Radwinter, Canon of Windsor, 1st edn. 1577, 2nd edn. 1587." It has recently been republished by the New Shakspere Society, * and as it is not accessible to all, I have thought that it may interest some of you if I extract the pith of it. Much of the book is mere compilation from other sources, but

* Published for the New Shakespeare Society by Trubner. Edited by Frederick J. Furnival, Director of the Society.

scattered throughout are sketches drawn from the quick of our forefathers and foremothers, the houses they lived in, the Churches they worshipped in, the gardens they made so gay and trim, of all their outward and inner life, their food, their drink, their clothes, their customs, their fads, their hopes, and fears, and loves. Peace be to their blessed memories, for they "smell sweet and blossom in their dust."

This book then is a permanent photograph of England as it was exactly three centuries ago, in the year of grace 1577. Scarce a page can you read without some echo of Shakespeare's plays rising before your remembrance. It throws a flood of light on contemporary history and literature. And what makes it so singularly fascinating is that, as you read, you keep on saying to yourself, that these men, and women, and children here described are neither French nor German (Harrison would call the latter Almains), but bone of your bone and flesh of your flesh, very English with all their whims, and tricks, and prejudices, and faults, and, let us hope some excellences, hardly of the past, but in all essentials like ourselves and our immediate parents.

But it is only fair to the worthy old author that I should say a word about him. William Harrison was his name. He was a Londoner born, educated at two great schools, St. Paul's and Westminster, and a graduate of both Universities, Oxford and Cambridge, "The children of Pawle's schoole," he says," whereof I was one, by the King's commandment went in general procession singing the Litany openly in thenglish toung." Henry VIII was the King, the date 1544, and Harrison ten or eleven years old. And speaking of schools or rather Collegiate Churches, as Windsor, Wincester, Eaton, Westminster, "In it" (*i.e.* Westminster), he says, "I was some time an unprofitable Grammarian under the Reverend father, Master Nowell, now Deane of Pawles, and it were a great number of poore scholars, dailie maintained by the liberalitie of the founders with meat, bookes, and apparell, from whence after they have been well entered in the knowledge of the Latin and Greek toungs, and rules of versifying, the trial whereof is made by certaine apposers yearlie appointed to examine them, they are sent to certaine especiall houses in each universitie."

He went first to Oxford, and took his M.A. there. Afterwards he proceeded to the degree of B.D. at Cambridge. He speaks with equal affection of both Universities. "In all things there is so greate an equalitie as no man can imagin how to set doune any greater." And he adds, "Would to God my knowledge were such as that neither of them might have cause to be ashamed of their pupil: or my power so great that I might worthilie requite them both for those manifolde kindnesses that I have received of them."

Before taking his B.D. he was Household Chaplain to Sir Wm. Brooke, Lord Cobham, who gave him the Rectory of Radwinter in Essex. In 1586 he was appointed Canon of Windsor. At Radwinter he was evidently very busy and very happy with his wife Marion, who with her maid "brewed him 200 gallons of beer for 20s., with his children, and his friends, among whom were the two famous antiquaries Camden and Stow, being withal, like Goldsmith's village preacher, "passing rich with forty pounds a year."

He worked hard among the poor of his parish, and had plenty of interests, and fads, his children, his dogs, his garden, his Roman coins. Speaking of dogs he says, "I had a mastiffe myself once which would not suffer anie man to bring in his weapon farther than my gate, neither those that were of my house to be touched in his presence. Or if I had beaten anie of my children, (this shows that he loved them), he would gently have assaid to catch the rod in his teeth, and take it out of my hand, or else pluck down their clothes to save them from the stripes: Which in my opinion is not unworthie to be noted." Marry and amen! the old dog, like his master, deserves his immortality.

The book shows what manner of man Harrison was. He was very shrewd, and had strongly developed opinions, most of them characteristically English, some right, some wrong, some very sound. He had a Reformer's dislike and dread of the Pope and "Papist monkes"; a thinly veiled contempt for Dissenters (as we should call them); an especial aversion to lawyers and dear justice; to selfish landowners, who cared more for their rabbits than their tenants; a burning indignation against great proprietors who unpatriotically converted villages into forests, thereby diminishing the population and weakening the manhood of England; a scorn for idle beggars who would not work but drone-like sucked the honey of their industrious brethren; for lazy young swells; for "willow men who lived in oaken houses;" and the same contempt that Roger Ascham entertained for full-pursed and empty-pated travellers who had made the great tour in Italy only to come back and sneer at the old ways, and the old folk at home, bidding you forsooth, "Keep faith only when you'll not lose by it: forgive when you're revenged: telling you that "a martyr's a fool," and urging you to believe nothing: never mind God, but obey the King."

How Harrison came to write the book was on this wise. The well-known chronicler Holinshed, whose work as many of you are aware, was the store-house to which Shakspere went for his facts, had for years been at work on the historical part of "a Universal Cosmographrie of the Whole World." The original publisher having died, his successors were afraid of the expense of so vast an encyclopaedia, and so resolved to produce only so much of it as related to England, Scotland, and Ireland. Application was

made to Harrison, who had for years been compiling a chronology of his own (3 folio volumes), to furnish the "Description of Britain and England." He set to work *con amore*, and "mainly by the help of Leland, as well as by letters and pamphlets from sundrie places, and divers shires, and by conference with divers folk, and by mine own reading I scrambled up this foule-frizeled treatise of mine." "Howsoer it be done I have had an especiall eye into the truth of things," and like Thucydides, when he knew not of a matter personally, he made all enquiry. Though of course his criticism is not of the modern type, yet here and there, while giving a story too wild to believe, but too good to suppress, he quaintly observes, "This soundeth like a lie."

The most interesting part of the Description is the second book, the contents of which are as follows:—

1 Of the ancient and present estate of the Church of England, p. 1.
2 Of the number of bishoprikes and their severall circuits, p. 38.
3 Of universities, p. 70.
4 Of the partition of England into shires and counties, p 90.
5 Of degrees of people in the commonwealth of England, p. 105.
6 Of the food and diet of the English, p. 141.
7 Of their apparell and attire, p. 167.
8 Of the high court of parlement and authoritie of the same, p. 178
9 Of the laws of England since hir first inhabitation, p. 188.
10 Of provision made for the poore, p. 212.
11 Of sundry kinds of punishment appointed for malefactors, p. 221.
12 Of the maner of building and furniture of our houses, pp. 233 and 337-9, 341.
13 Of cities and townes in England, p. 244.
14 Of castels and holds, p. 262.
15 Of palaces belonging to the prince, p. 267.
16 Of armour and munition, p. 278.
17 Of the navie of England, p. 285.
18 Of faires and markets, p. 294.
19 Of parks and warrens, p 303.
20 Of gardens and orchards, p 322.
21 Of waters generallie, p. 332.
22 Of woods and marishes, p. 336.
23 Of baths and hot welles, p. 347.
24 Of antiquities found, p 356.
25 Of the coines of England, p. 361.
(Notes on Trees, Richborow, p. 366).

Here is a goodly diversity, and in truth I hardly know how to group so many particulars round an intelligible centre. It might be interesting enough to describe Harrison in his home with all his surroundings and belongings, a country parson of Elizabeth's days. But I should not know how to bring in many matters of a wider interest, which indeed I propose to add in from other sources without confining myself rigidly to the Description. The reprint of the book is enriched with a map of London published in 1593 by John Norden a Wiltshireman. It is one of the oldest extant maps of the City, and shows us what London must have looked like when Harrison wrote his volume. It is the London of Burleigh, of Bacon, of Shakspere.

This I shall take as the nucleus round which to gather the somewhat promiscuous hints of English life. London was, you see,* a small place in

* The paper was illustrated by a sketch on the blackboard.

the time of Elizabeth, with hills standing around it, like Marlborough, and like Jerusalem, tree-topped hills, and fields dotted with villages which were connected with the city by country roads, and green lanes. Without the walls, and a little distance from extra-mural London, lies the country. To the W. is Holborn and the present Oxford-street, and the Uxbridge road leading to Windsor, of which Harrison was canon, and to Oxford, where he graduated. Let us think of him as travelling up from Oxford by Windsor, after meeting old friends at a Gaude, and so let us collect our notes under two heads (1) Country, (2) Town.*

From Oxford to London! But perchance he had previously been restoring his health at Bath, whither, like many others, he had once been to drink the waters. Wholesome or not hygienically, he relished them not. "The water reeketh much after the maner of a seething pot, commonly yielding somewhat of a sulpherous taste, and very unpleasant savour." So thought Parson Harrison, and so in later days Mr. Samuel Weller. Our author is great on the subject of baths, and bathing establishments at Bath, Buxton, Rugby and elsewhere, though "the Papistes, for their own ends, told rare lies about them."

And what did Oxford of that age look like? The first extract shall be from Hentzner, a German, writing in 1598.

"These Students lead a life almost monastic; for as the monks had nothing in the world to do, but when they had said their prayers at stated hours, to employ themselves in instructive studies, no more have these. They are divided into three Tables: the first is called the Fellows Table, to which are admitted Earls, Barons, Gentlemen, Doctors, and Masters of Arts, but very few of the latter; this is more plentifully and expensively served than the others: The Second is for Masters of Arts, Batchelors, some Gentlemen, and eminent Citizens: The Third for people of low condition. While the rest are at dinner or supper in the great Hall, where they are all assembled, one of the Students reads aloud the Bible, which is placed on a desk in the middle of the Hall, and this office every one of them takes upon himself in his turn; as soon as Grace is said after each meal, every one is at liberty, either to retire to his own chambers, or to walk in the College garden, there being none that has not a delightful one."

The same traveller speaks of the situation (probably he had not resided during the autumn or early spring.)

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* I would strongly recommend the perusal of a paper in the Cornhill for January, 1877: "From Stratford to London," by a very accomplished writer, my friend Mr. Hales formerly Assistant Master here. For Oxford of this period by all means read that admirable chapter of an admirable book "the Life of Isaac Casaubon," by the Rector of Lincoln College.

"*Oxonium*, Oxford, the famed Athens of England; that glorious seminary of learning and wisdom, whence religion, politeness and letters are abundantly dispersed into all parts of the kingdom: The town is remarkably fine, whether you consider the elegance of its private buildings, the magnificence of its public ones, or the beauty and wholesomeness of its situation; which is on a plain, encompassed in such manner with hills shaded with wood, as to be sheltered on the one hand from the sickly South, and the other from the blustering West, but open to the East that blows serene weather, and to the North the preventer of corruption; from which in the opinion of some it formerly obtained the appellation of Bellositum."

Of the buildings Harrison, himself, remarks:—

"The colleges of Oxford, for curious workemanship and privat commodities, are much more statelie, magnificent, and commodious than those of Cambridge: and thereunto the streets of the towne for the most part more large and comelie. But for uniformitie of building, orderlie compaction, and [politike] regiment, the towne of Cambridge, [as the newer workmanship], exceedeth that of Oxford (which otherwise is, and hath beene, the greater of the two) by manie a fold [(as I gesse)] although I know diverse that are of the contrarie opinion."

And again:—

"The common schooles of Cambridge also are farre more beautiful than those of Oxford, onelie the divinitie schoole at Oxford excepted, which for fine and excellent workemanship, commeth next the moold of the kings chappell in Cambridge, than the which two with the chappell that king Henrie the seaventh did build at Westminster, there are not (in mine opinion) made of lime and stone three more notable piles within the compasse of Europe."

Further on he speaks of University life.

"The manner to live in these universities, is not as in some other of forren countries we see dailie to happen, where the students are inforced for want of such houses, to dwell in common innes, and taverns, without all order or discipline. But in these our colleges we live in such exact order, and under so precise rules of governement, [as] that the famous learned man *Erasmus* of *Roterdame* being here among us 50 yeres passed, did not let to compare the trades in living of students in these two places, even with the verie rules and orders of the ancient moonks: affirming moreover in flat words, our orders to be such as not onlie came neere unto, but rather far exceeded all the monastical institutions that ever were devised.

In most of our colleges there are also great numbers of students, of which manie are found by the revenues of the houses, and other by the purveiances and helpe of their rich freends; whereby in some one college you shall have two hundred scholers, in others an hundred and fiftie, in diverse a hundred

and fortie, and in the rest lesse numbers; as the capacitie of the said houses is able to receive: so that at this present, of one sort and other, there are about three thousand students nourished in them both (as by a late survele it manifestlie appeared.")

And this of the teaching staff:—

"Everie one of these colleges have in like manner their professers or readers of the toongs and severall sciences, as they call them, which dailie trade up the youth there abiding privatlie in their halles, to the end they may be able afterward (when their turne commeth about, [which is after twelve termes]) to shew themselves abroad, by going from thence into the common schooles and publike disputations (as it were *In aream*) there to trie their skilles and declare how they have profited since their comming thither."

"Finallie, this will I saie, that the professors of either of those faculties come to such perfection in both universities, as the best students beyond the sea doo in their owne or else where. One thing onlie I mislike in them, and that is their usuall going into Italie, from whense verie few without speciall grace doo returne good men, whatsoever they pretend of conference or practice, chiefelie the physicians, who under pretense of seeking of forreine simples, doo oftentimes learne the framing of such compositions as were better unknown than practised, as I have heard oft alledged, and therefore it is most true that doctor *Turner* said; Italie is not to be seene without a guide, that is without speciall grace given from God, bicause of the licentious and corrupt behaviour of the people."

And once more, on the subject of "Idle Fellowships," he says:—

"Thus we see, that from our entrance into the universitie unto the last degree received, is commonlie eighteene or [peradventure] twentie yeeres, in which time if a student hath not obteined sufficient learning, thereby to serve his owne turne, and benefit his common wealth, let him never looke, by tarieng longer, to come by anie more. [For after this time and 40 yeeres of age, the most part of students doo commonlie give over their woonted diligence, and live like drone bees on the fat of colleges, witholding better wits from the possession of their places, and yet doing litle good in their own vocation and calling. I could rehearse a number (if I listed) of this sort as well in the one universitie as the other."]

Of a state of things happily passed away, he tells us:—

'Such packing also is used at elections, that not he which best deserveth, but he that hath most friends, though he be the woorst scholer, is alwaies surest to speed; which will turn in the end to the overthrow of learning."

"In some grammar schooles likewise, which send scholers to these universities, it is lamentable to see what briberie is used; for yer the scholer can be preferred, such bribage is made, that poore mens children are com-

monlie shut out, and the richer sort received (who in time past thought it dishonor to live as it were upon almes) and yet being placed, most of them studie little other than histories, tables, dice, and trifles, as men that make not the living by their studie the end of their purposes, which is a lamentable hearing."

And lastly of a state of things not wholly passed away:—

"Beside this, being for the most part either gentlemen, or rich mens sons, they oft bring the universities into much slander. For, standing upon their reputation and libertie, they ruffle and roist it out, exceeding in apparell, and banting riotous companie (which draweth them from their bookes unto another trade.) And for excuse, when they are charged with breach of all good order, thinke it sufficient to saie, that they be gentlemen, which greeveth manie not a litle."

"This also is certeine, that whatsoever the difference be in building of the towne streets, the townesmen of both are glad when they may match and annoie the students, by incroching upon their liberties, and keepe them bare by extreame sale of their wares, whereby manie of them become rich for a time, but afterward fall again into povertie, bicause that goods evill gotten doo seldome long endure."

Thus much for Oxford.

Travelling in those days was neither so easy nor so safe as now. You had best go afoot or a horseback. You might take your place in a carrier's cart, hailing the driver with "Sirrah Carrier, when do you mean to come to London?" You would probably avoid a public conveyance. They were not comfortable, being neither more nor less than big boxes placed immediately on wheels, bone-crushing tumbrils in fact. The chief objection to these "Hell-carts" however (for so they were nicknamed in the reign of Charles the 2nd) was not that "they confounded your supple joints," but that they broke up the roads like the traction engines of our times. And no wonder, for this is a description of the road between Oxford and London in 1592 by a Dutch visitor, Jacob Rathgeb by name.

"On the road we passed through a villainous, boggy, and wild country, and several times missed our way, because the country thereabouts is very little inhabited, and is nearly a waste; and there is one spot in particular where the mud is so deep, that in my opinion it would scarcely be possible to pass with a coach in winter or rainy weather."

The Beggars would be a sad nuisance. For the honest poor, whom Christ bids us feed, provision is made in the weekly offertory, our parson reminds us. But there be many sets of sturdy beggars who make a trade of begging, inflicting horrible sores upon themselves, and piteously whining "For the Lordes sake," "For God's sake." Other sturdy beggars there be

that sham serving men, labourers, seamen. "Thieves and caterpillars in the Commonwealth be they, who licke the sweate from the true workmen's brows, and deserve whipping rather than alms." For the several degrees of beggars male and female Harrison's vocabulary is very rich. There are "ruffiers, roges, wild roges, priggers or prancers, fraters, Abrams, drunken tinkers, and other less mentionable names, 23 sorts in all." "I speake not of such as unrighteouslie have been ejected from their little holdings, by some covetous great man for the sake of private gains, or enclosures—at whose hands shall the blood of these men be required?—but for those other kinds, God is far from such." "Not a penny, not a penny, rascal," the parson will exclaim, and stride on with unlightened girdle.

And there were perils along the road, perils by robbers and that by your own countrymen. Sir John Falstaff and his pals might be on the prowl for a purse, having ascertained from the Chamberlain of the Inn where you had lain overnight how much you carried and which way you would pass. There were many "unthrift young gentlemen" (he is much too polite): and "serving men turned beggars" of which later set of scamps were so many contemporary complaints. If you were weak and lily-livered you might ejaculate "Jhesu bless us!" and surrender your girdle. But if you were made of other mettle you would go armed, and like the Prince and Poins would set on the thieves. This shews how you should travel and what you might expect—

"I might here speake of the excessive staves which diverse that travell by the waie doo carrie upon their shoulders, whereof some are twelve or thirteene foote long, beside the pike of twelve inches: but as they are commonlie suspected of honest men to be theeves and robbers, or at the leastwise scarse true men which bare them; so by reason of this and the like suspicious weapons, the honest traveller is now inforced to ride with a case of dags at his sadle bow, or with some pretie short snapper, whereby he may deale with them further off in his own defence, before he come within the danger of these weapons. Finallie, no man travelleth by the waie without his sword, or some such weapon, with us; except the minister, who commonlie weareth none at all, unlesse it be a dagger or hanger at his side. Seldome also are they or anie other waifaring men robbed, without the consent of the chamberleine, tapster, or ostler, where they bait and lie, who feeling at their alighting whether their capcases or budgets be of anie weight or not, by taking them downe from their sadles, or otherwise see their store in drawing of their purses, do by and by give intimation to some one or other attendant dailie in the yard or house, or dwelling hard by, upon such matches, whether the preie be worth following or no. If it be for their turne, then the gentleman peradventure is asked which way he travelleth, and whether it please him to have another ghest to beare him companie at supper, who rideth the same

waie in the morning that he doth, or not. And thus if he admit him, or be glad of his acquaintance, the cheate is halfe wrought. And often it is seene that the new ghest shall be robbed with the old, onlie to colour out the matter and keepe him from suspicion. Sometimes when they knowe which waie the passenger travelleth, they will either go before and lie in wait for him, or else come galloping apace after, whereby they will be sure, if he ride not the stronger, to be fingering with his purse. And these are some of the policies of such shrews, or close booted gentlemen, as lie in wait for fat booties by the high waies, and which are most commonlie practised in the winter season about the feast of Christmas, when serving men and unthriftie gentlemen want monie to plaie at the dice and cards, lewdlie spending in such wise whatsoever they have wickedlie gotten, till some of them sharplie set upon their chevisances, be trussed up in a Tiburne tippet which happeneth unto them commonlie before they come to middle age. Whereby it appeereth that some sort of youth will oft have his swinge, although it be in a halter."

But there were pleasanter scenes too. Here is a little idyll, descriptive of a Berkshire harvest-home, written by one Hentzner, a German who visited England in 1598—

"As we were returning to our inn [at Windsor, Sept. 14th], we happened to meet some country people celebrating their Harvest-home; their last load of corn they crown with flowers, having besides an image richly dressed, by which, perhaps, they would signify Ceres; this they keep moving about, while men and women, men and maid servants, riding through the streets in the cart, shout as loud as they can till they arrive at the barn. The farmers here do not bind up their corn in sheaves, as they do with us, but directly as they have reaped or mowed it, put it into carts, and convey it into their barns."

Do not some of you remember the masque in the Tempest where enter severally Iris, Ceres, and Juno, and to them "certain reapers properly habited." And to them Iris chants this music—

> You sun-burnt sicklemen of August weary
> Come hither from the furrow, and be merry;
> Make holiday: your rye straw hats put on
> And these fresh nymphs encounter every one
> In country footing.

But if you escaped with a sound skin and full purse you must needs take your ease in your inn, not the famous Boar's Head at Eastcheap, that was a city tavern, but a roadside hostel. If your landlord was an honest fellow you might have a snug time of it, at least so judged a well-known traveller, Fynes Morison, writing in 1617.

"The World affoords not such Innes as England hath, either for good and

cheape entertainement after the Guests owne pleasure, or for humble attendance on passengers; yea, even in very poore villages. . . . For assone as a passenger comes to an Inne, the servants run to him, and one takes his horse and walkes him till he be cold, then rubs him and gives him meate, yet I must say they are not much to be trusted in this last point, without the eye of the Master or his servant to oversee them. Another servant gives the passenger his private chamber, and kindles his fier; the third puls of his boots, and makes them cleane. Then the Host or Hostesse visit him; and if he will eat with the Host, or at a common table with others, his meal will cost him sixe pence, or in some places but foure pence (yet this course is less honourable, and not used by Gentlemen); but if he will eat in his chamber, he commands what meate he will, according to his appetite, and as much as he thinks fit for him and his company, yea, the kitchen is open to him, to command the meat to be dressed as he best likes; and when he sits at Table, the Host or Hostesse will accompany him, or, if they have many Guests, will at least visit him, taking it for curtesie to be bid sit downe: while he eates, if he have company especially, he shall be offred musicke, which he may freely take or refuse; and if he be solitary, the musitians will give him the good day with musicke in the morning. (It is the custome, and no way disgraceful, to set up part of supper for his breakefast). In the evening or in the morning after breakefast, (for the common sort use not to dine, but ride from breakefast to supper time, yet coming early to the Inne for better resting of their Horses) he shall have a reckoning in writing, and if it seeme unreasonable, the Host will satisfie him either for the due price, or by abating part, especially if the servant deceive him any way, which one of experience will soon find. . . I will now onely adde, that a Gentleman and his man shall spend as much as if he were accompanied by another Gentleman and his man: and if Gentlemen will in such sort joyne together to eate at one Table, the expenses will be much diminished. Lastly, a Man cannot more freely command at home in his owne House, then hee may doe in his Inne; and at parting, if he give some few pence to the Chamberlain and Ostler, they wish him a happy journey."

Every town and village you passed, as in Switzerland now-a-days, had its armoury (p. 280), the smallest for three or four soldiers: and there were regular inspections of men and arms, but, alas! how the English long-bow of the old time had gone out of use:—

"But now we have in maner generallie given over that kind of artillerie, and for long bowes in deed doo practise to shoot compasse for our pastime: which kind of shooting can never yeeld anie smart stroke, nor beat down our enemies, as our countrie men were woont to doo at everie time of need. Certs the Frenchman and Rutters deriding our new archerie in respect of

their corflets, will not let, in open skirmish, if anie leisure serve, to turne up their tailes and crie: "Shoote English," and all because our strong shooting is decaied and laid in bed."

Every town had its markets (p. 294, &c.): but little inspection of goods was carried on, as the law required, to insure that the Queen's subjects had honest measure and unadulterated food. "Bodgers" bought up corn and raised the price of it, or exported it to feed fat Papists and the Queen's enemies. Purveyors bought up country produce and sold elsewhere, so that throughout the realm was a cry against high prices. Why not do away with intermediate dealers?" asks the parson, that is to say, "Why not establish cooperative stores?"

But there's the farmer's house and the farmer. How does he fare? Of late years he has much improved. Rents have risen, but "in a farmer's house where of old time you saw naught but pewter you shall now see three or four feather beds, and tapestry carpets, and a silver salt cellar, a wine bowl, and a dozen spoons," but when a Farmer renews his lease (here we stir up modern difficulties, as you must have already observed we have done before) his Landlord "sweeps off all as clean as the barber shaves his chin."

If you kept your eyes open you would see how old England was changing into modern England. The nobility do not disdaine to go into trade. One lady (p. 305) sells her husband's venison: another has ridden to market to see her butter sold: an Earl feels his own cattle to see whether they're ready for the butcher. These may be matters of taste, but there's a line to be drawn. Business must not encroach on patriotism. How can it be well to pull down houses and break up villages? Harrison knows a "well-burnished gentleman who turned one 60 woods into one pair of galligascons" (*videlicet* breeches): while it was an ordinary thing for owners "desirous to enlarge their grounds for the breed of cattell not to spare the very commons" (you recognize one of the burning questions of the day). "The decay of a people is the destruction of a Kingdom," he exclaims like a Hebrew prophet, or a Greek elegiac poet, "neither is any man born to possess the earth alone." Therefore, antiquary as he was, he deplores not the decay of castles—

"For I need not to make anie long discourse of castels, sith it is not the nature of a good Englishman to regard to be caged up as in a coope, and hedged in with stone wals, but rather to meet with his enimie in the plaine field at handstrokes, where he may travaise his ground, choose his plot, and use the benefit of sunne shine, wind and weather, to his best advantage and commoditie. [Isoctrates also saith that towres, walles, bullworks, soldiers, and plentie of armour, are not the best keepers of kingdomes; but freends, love of subjects, and obedience unto martiall discipline; which they want that shew themselves either cruel or covetous towards their people]. As for

those tales that go of Beston castell, how it shall save all England on a daie, and likewise the brag of a rebellious baron in old time [named Hugh Bigot], that said in contempt of king Henrie the third.

If I were in my castell of Bungeie,
Upon the water of Waveneie,
I wold not set a button by the king of Cockneie.

I repute them as toies."

Of Windsor however and its history, of Windsor, the seat not of tyranny but of Majesty, he has much to say, though it's not for him to describe it, for, Canon as he was, he had hardly dared peep in at the gates.

But who had not heard of the royal palaces, Greenwich, Eltham, Hatfield, Richmond, Hampton, and others? And any wayfarer might kneel down, cap in hand. as her Majesty rode past in pride, pomp, and circumstance on a royall progress, whether to right poor folk's wrongs, or to visit each college at Oxford or Cambridge, and make an oration in Latin "to the great comfort of all such as are or had been students there." He certainly talks no scandal of Queen Elizabeth. Her court is the most renowned in Europe: her household the most virtuous in the land ("would to God our nobles were as ruled as our Queen's!"): the maids of honour are lovely and well-attired; they can cook like Imogen, mainly after Portuguese recipes (*cicutis allium nocentius* no doubt); they know Greek, Latin, Spanish, French (all Lady Jane Greys in fact); whereas the old Court Ladies, before the days of the higher female education "would spin, read the Bible or Histories, or shew their skill in surgery and medicine."

But we shall never reach London at this rate. Let us be there, passing through the village of Charing, and going under Temple Bar (which by the way was not in the city proper). What a clatter! What a hubbub!

". . the ballade-singer's auditorie,
which hath at Temple-bar is standing chose,
and to the vulgar sings an alehouse storie.
First stands a Porter: then an Oyster wife
Doth stint her crie, and stay her steps to heare him,
Then comes a cutpurse ready with a knife,
and then a cuntry Client passeth neere him,
There stands the Cunstable, there stands the rogue,
And harkning to the song, mark not each other.
There by the Serieant, stands the debtor poore,
And doth no more mistrust him then his brother:
Thus Orpheus to such hearers giveth musique,
And Philo [the quack] to such Patients giveth physicke." *

* Sir John Davies, Epigrammes, 1590.

On the ground floor the shops were mostly open, like barber's shops in France, says the disdainful M. Perlin writing in 1558. But the truth is that the show room were on the first floor. The jeweller's and the cloth-makers' warehouses struck even foreigners with admiration.

"Of Londons p ide I will not boast upon,
Her gold, her silver, and her ornaments;
Her Gems and Jewells, pearles and precious stone,
Her furniture and rich habilliments;
Her cloth of silver tissue, and of gold,
Which in her shops men dayly may behold" †

And those strapping free and easy fellows, lounging bareheaded cap in hand against the shopdoors! They are the apprentices, ever ready for a shindy at the cry of "clubs," or "bills!"

En passant parmi les rues vous en trouverez cinquante ou soixante contre les murailles comme idoles, ayant leurs bonnets à la main. (Perlin, 1558).

In the London shops you might see the produce of all lands. Trade and commerce had been wonderfully developed. Not content with their old European trade into Spaine, Portingale, France, Flanders, Danske, Norwaie, they go now to the Canaries, New Spaine, Cathaia, Moscovia, Tataria (you know now Arctic voyages began thus). But prices go up terribly. We want free-trade, sighs Harrison. "In times past when strange bottoms (foreign ships) were suffered to come in we had sugar for 4d. that is now half-a-crowne, raisins or corints for a penny that are now holden at 6d. Of course 'tis an ill wind that blows none to good. A successful merchant now buys a poor gentleman's lands, procures a coat of arms from the Herald's Office, educates his sons for professions, or leaves money to them to become gentlemen."

"The toe of the peasant comes so near the heel of the courtier, he galls his Kybe."

And these exquisites, these Osrics, these waterflies, so neat and trimly dressed, perfumed like milliners, that so deface God's handiwork! What be they? Finery, it must be owned, was ever the weakness of English men and women. "Many a woman," says Heer Jacob Rathgeb (1585), "does not hesitate to wear velvet in the streets, whilst at home perhaps they have not a piece of dry bread." "They are very inconstant and desirous of novelties, changing their fashion every year both male and female," says another Dutchman in 1575. Nor are these the calumnies of foreigners. One of our own prophets hits his countrymen far harder.

"An Englishman, indevoring sometime to write of our attire, made sundrie

† Richard Johnson, 1607.

platformes for his purpose, supposing by some of them to find out one stedfast ground whereon to build the summe of his discourse. But in the end (like an oratour long without exercise) when he saw what a difficult peece of worke he had taken in hand, he gave over his travell, and onlie drue the picture of a naked man. unto whome he gave a paire of sheares in the one hand, and a peece of cloth in the other, to the end he should shape his apparell after such fashion as himselfe liked, sith he could find no kind of garment that could please him anie while togither; and this he called an Englishman." (Andrew Boorde, 1542.)

This is true, Harrison confesses, albeit in other respects the writer is "a lewd popish hypocrite, and ungratious priest." "For my part," says Harrison, "I can't describe an Englishman's dress. There is first the Spanish fashion, then the French, then the high Almain; the Turkish maner; Morisco gowns with short French breeches. How men and women worry the tailor! how they abuse him! how much cost is bestowed now-a-daies upon our bodies, and how little upon our souls." Then for the beards, but hear Shakspere on that, "your straw-colour'd beard, your orange-tawney beard, your purple in grain beard, your French crown colour beard, your perfect yellow." "Good Lord!" (this is Harrison again), "the men look as absurd as a dog in a doublet: and the women, they'er worse than the men, with their paint, and their false hair, with their jags, and cuts, and sleeves, and fardingals, and diversely coloured stockings! I have met them so disguised that it hath passed my skill to discern whether they were men or women!"

Let us now to Paul's, and as we stroll up and downe "Paule's walk" (a promenade rather than a house of prayer), Canon Harrison shall discourse briefly of Churches.

First of the interiors—

"As for our churches themselves, belles, and times of morning and evening praier, remaine as in times past, saving that all images, shrines, tabernacles, roodlofts, and monuments, of idolatrie are remooved, taken downe, and defaced; onelie the stories in glasse windowes excepted, which for want of sufficient store of new stuffe, and by reason of extreame charge that should grow by the alteration of the same into white panes throughout the realme, are not altogither abolished in most places at once, but by little and little suffered to decaie, that white glasse may be provided and set up in their roomes. Finallie, whereas there was woont to be a great partition betweene the quire and the bodie of the church; now it is either verie small or none at all; and to saie the truth altogither needlesse, sith the minister saith his service commonlie in the bodie of the church with his face toward the people, in a little tabernacle of wainscot provided for the purpose: by which means the ignorant doo not onelie learne diverse of the psalmes and

usuall praiers by heart, but also such as can read, doo praie togither with him; so that the whole congregation at one instant powre out their petitions unto the living God, for the whole estate of his church in most earnest and fervent manner."

Next of the services;

"There is nothing read in our churches but the canonicall scriptures, whereby it commeth to passe that the psalter is said over once in thirtie daies, the new testament foure times, and the old testament once in the yeare. And hereunto if the curat be adiudged by the bishop or his deputies, sufficientlie instructed in the holy scriptures, [and therewithall able to teach,] he permitteth him to make some exposition or exhortation in his parish, unto amendment of life. And for so much as our churches and universities have beene so spoiled in time of errour, as there cannot yet be of such number able pastors as may suffice for everie parish to have one: there are [(beside foure sermons appointed by publike order in the yeare)] certeine sermons or homilies (devised by sundrie learned men, confirmed for sound doctrine by consent of the divines and publike authoritie of the prince) and those appointed to be read by the curats of meane understanding (which homilies doo comprehend the principall parts of christian doctrine, as of originall sinne, of iustification by faith, of charitie, and such like) upon the sabbaoth daies, unto the congregation. And after a certeine number of psalmes read, which are limited according to the dates of the month, for morning and evening praier, we have two lessons, whereof the first is taken out of the old testament, the second out of the new; and of these latter, that in the morning is out of the gospels, the other in the afternoone, out of some one of the epistles. After morning praier also we have the letanie and suffrages, an invocation in mine opinion not devised without the great assistance of the spirit of God, although manie curious mindsicke persons utterlie condemne it as superstitious, and savoring of coniuration and sorcerie.

This being doone, we proceed unto the communion, if anie communicants be to receive the eucharist; if not we read the decalog epistle and gospel, with the Nicene creed (of some in derision called the drie communion,) and then proceed unto an homilie or sermon, which hath a psalme before and after it, and finallie unto the baptisme of such infants as on everie sabaoth daie (if occasion so require) are brought unto the churches: and thus is the forenoone bestowed. In the afternoone likewise we meet again, and after the psalmes and lessons ended, we have commonlie a sermon or at the leastwise our youth catechised by the space of an houre. And thus doo we spend the sabaoth daie in good and godlie exercises, all doone in our vulgar toong, that each one present may heare and understand the same, which also in cathedrall and collegiat churches is so ordered, that the psalms onelie are soong by note,

the rest being read (as in common parish churches) by the minister with a lowd voice, saving that in the administration of the communion the quier singeth the answers, the creed, and sundrie other things appointed, but in so plaine, I saie and distinct maner, that each one present may understand what they sing, everie word having but one note, though the whole harmonie consist of manie parts, and those verie cunninglie set by the skilfull in that science."

Next of the dress of the clergy—

"The apparel in like sort of our clergie men is comlie, and in truth, more decent than ever it was in the popish church: before the universities bound their graduats unto a stable attire, afterwards usurped also even by the blind Sir Johns. For if you peruse well my chronologie insuing, you shall find, that they went either in diverse colours like plaiers, or in garments of light hew, as yellow, red, greene, &c.: with their shooes piked their haire crisped, their girdles armed with silver; their shooes, spurres, bridles, &c,: buckled with like mettall: their apparel (for the most part) of silke, and richlie furred; their cappes laced and buttoned with gold: so that to meet a priest in those daies, was to behold a peacocke that spreadeth his taile when he danseth before the henne: which now (I saie) is well reformed."

Nigh Paul's will be Paul's school, where Harrison was first sent. Schools and colleges when he was a boy were much exercised touching the pronunciation of Greek:—

"Great trouble in the Universities of England about the pronounciation of the Greke toung. Mr. William Cecill, afterwards Sir William Cecill and Lord highe Threasurer of England, Mr. Jhon Cheke, afterward Sir Jhon Cheke, and Mr. Thomas Smithe, afterward Sir Thomas Smithe, and other of the lerned sort, mainteining the new pronounciacion used by Erasmus, as the most auncient, easie, and familiar, to attaine unto the true writing or orthographie of that language. Against these, Doctor Stephen Gardiner, then Bishop of Winchester and chancellour of the University of Camebridge, opposeth himself,—a man not greatly seene in that tounge,—and, upon a complaint made by the oldest sort of studentes, in defence of the old pronounciacion, imprisoneth, expelleth, disgradeth, and poinesheth the studentes there, very grevously, till order was taken wherby, unto our times, the new pronounciacion was not onely permitted, but in time so allowed of, that the old is not now so moche as scasely knowen nor hard of in any of them bothe. Doctor Camus, the phisicien, semeth not to like of this chaunge, in his description of Cambridge, when, in reprochе, he calleth Sir Jhon Cheke "Cecum ludimagistrum," and Sir Thomas Smithe "insanum consiliarum' (*sic*) alas, a pore revenge to procede from soche a clerke as he."

* * * *

So much for the city. Let us now take a boat, and slip down with the tide to Greenwich. Our German friend Hentzner (1598) shall speak:—

"We arrived next at the royal palace of Greenwich, reported to have been originally built by Humphrey Duke of Gloucester, and to have received very magnificent additions from Henry VII. It was here Elizabeth, the present queen, was born, and here she generally resides; particularly in summer, for the delightfulness of its situation. We were admitted by an order Mr. Rogers had procured from the Lord Chamberlain, into the Presence chamber, hung with rich tapestry, and the floor, after the English fashion, strewed with hay, through which the Queen commonly passes in her way to chapel: At the door stood a gentleman dressed in velvet, with a gold chain, whose office was to introduce to the Queen any person of Distinction, that came to wait on her: It was Sunday, when there is usually the greatest attendance of Nobility. In the same hall were the Archbishop of Canterbury, the Bishop of London, a great number of Councillors of State, Officers of the Crown, and Gentlemen, who waited the Queen's coming out; which she did from her own apartment, when it was time to go to Prayers, attended in the following manner:

First went Gentlemen, Barons, Earls, Knights of the Garter, all richly dressed and bare-headed; next came the Chancellor, bearing the seals in a red silk Purse, between Two,; one of which carried the Royal Scepter, the other the Sword of State, in a red scabbard, studded with golden Fleurs de Lis, the point upwards: Next came the Queen, in the Sixty-fifth year of her Age, as we were told, very majestic; her Face oblong, fair, but wrinkled; her Eyes small, yet black and pleasant; her nose a little hooked; her Lips narrow, and her teeth black; (a defect the English seem subject to, from their too great use of sugar) she had in her Ears two pearls, with very rich drops; she wore false Hair, and that red; upon her Head she had a small Crown, reported to be made of some of the gold of the celebrated Lunebourg table. Her Bosom was uncovered, as all the English ladies have it, till they marry; and she had on a Necklace of exceeding fine jewels; her Hands were small, her Fingers long, and her Stature neither tall nor low: her air was stately, her manner of speaking mild and obliging. That day she was dressed in white Silk, bordered with pearls of the size of beans, and over it a mantle of black silk, shot with silver threads; her Train was very long, and the end of it born by a Marchioness; instead of a Chain she had an oblong Collar of gold and jewels. As she went along in all this state and magnificence, she spoke very

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* Here followed a description of the city as chalked on the black-board. I have condensed this in the form of a note at the end of my paper.—F.E.T.

gratiously, first to one, then to another, whether foreign Ministers, or those who attended for different reasons, in English, French, and Italian; for besides being well-skilled in Greek, Latin, and the languages I have mentioned she is mistress of Spanish, Scotch, and Dutch: Whoever, speaks to her, it is kneeling; now and then she raises some with her Hand. While we were there, W. Slawatta, a Bohemian Baron, had letters to present to her; and she, after pulling off her glove, gave him her right Hand to kiss, sparkling with rings and jewels, a mark of particular Favour: Wherever she turned her Face, as she was going along, everybody fell down on their knees. The Ladies of the Court followed next to her, very handsome and well-shaped, and for the most part dressed in white; she was guarded on each side by the Gentlemen Pensioners, fifty in number, with gilt battle-axes; in the Anti-chapel next the Hall where we were, Petitions were presented to her, and she received them most graciously, which occasioned the acclamation of Long live Queen Elizabeth! She answered it with, I thank you, my good people. In the Chapel was excellent music; as soon as it, and the Service was over, which scarce exceeded half-an-hour, the Queen returned in the same state and Order, and prepared to go to Dinner. But while she was still at Prayers, we saw her Table set out with the following Solemnity:

A Gentleman entered the room bearing a rod, and along with him another who had a table-cloth, which after they had both kneeled three times, with the utmost veneration, he spread upon the table; and after kneeling again, they both retired. Then came two others, one with the rod again, the other with a salt-seller, a plate, and bread; when they had kneeled as the others had done, and placed what was brought upon the table, they too retired with the same ceremonies performed by the first. At last came an unmarried Lady, (we were told she was a Countess) and along with her a married one, bearing a tasting-knife; the former was dressed in white silk, who, when she had prostrated herself three times, in the most graceful manner approached the table and rubbed the plates with bread and salt, with as much awe as if the Queen had been present: When they had waited there a little while, the Yeoman of the Guard entered, bare-headed, cloathed in scarlet, and with a golden rose upon their backs, bringing in at each turn a course of twenty-four dishes, served in plate, most of it gilt; these dishes were received by a Gentleman in the same order they were brought, and placed upon the table, while the Lady-Taster gave to each of the guard a mouthful to eat, of the particular dish he had brought, for fear of any poison. During the time that this guard, which consists of the tallest and stoutest men that can be found in all England, being carefully selected for this service, were bringing dinner, twelve trumpets, and two kettle-drums made the hall ring for half-an-hour together. At the end of all this ceremonial, a

number of unmarried ladies appeared, who with particular solemnity lifted the meat off the table, and conveyed it into the Queen's inner and more private chamber, where, after she had chosen for herself, the rest goes to the Ladies of the Court.

The Queen dines and sups alone with very few attendance; and it is very seldom that any body, foreign or native, is admitted at that time, and then only at the intercession of somebody in power.

Near this palace is the Queen's Park stocked with deer: such parks are common throughout England, belonging to those that are distinguished either for there rank or riches. In the middle of this is an old square Tower, called MIREPLEUS, supposed to be that mentioned in the romance of Amadis de Gaul; and joining to it a plain, where knights and other gentlemen use to meet at set times and holydays to exercise on horse-back."

Thanks, good Master Parson Harrison, and now we shall part; for to tell truth I go to visit my Cousin Robert who is studying at Gray's Inn. My Uncle his father is a rich lawyer, and the parson would scarce be civil in his presence. Moreover I think to go in the afternoon with my coz to see a new play at Blackfriar's by Mr. Wm. Shakspere, whom some do affirm to be the Terence of our age, and the Canon misliketh the playhouse.

My uncle lives nigh unto Cheapside, a little to the north of it. He hath newly furnished * a house here. I enter with Bob. we kiss all round, more Anglico as the great Erasmus would playfully say. Dinner will be ready in half an hour, and my uncle will show me his house. This is brave! The walls of this room are scaled with English oak, or wainscot brought hither out of the East countries. That is hanged with tapisterie, arras work, or painted cloth, wherein are divers histories as herbes, beasts, knots, and the like. Ah! and there is a new German stove. "Hitherto, says my uncle, we have not used them greatly, but they do now begin to be made in divers houses not to work or feed by, but now and then, for—a Roman bath! "to sweate in as occasion shall require." And everywhere chimnies. In our old house at home, uncle, are "nought but reredosses against the wall where each doth dress his meat."

And what beds; pillows to all, by my halidom! why they were wont to to say that pillows were only needed for sick women.

Uncle, thou hast everything, save a garden.† Thou mays't not have true *rus in urbe* for all the Roman might boast. In our garden we have 300 species for simples; rare medicinable herbs. That noble herbalist, Carolus

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* Chapter 12. "Of the maner of building and furniture of our houses" is most interesting.

† See the chapter on Gardens and Orchards.

Clusius, could he visit us would find material for many unknown drugs. We have foreign fruits, almonds, figs, melons, oranges, lemons, all manner of vegetables, pompions, gourds, cucumbers, skirets, parsneps, cabbages, turneps, and all kinds of salad herbes. And for flowers we have things of beauty for every month in the year. With us Art helpeth nature in the Colouring and Doubling of flowers.

Right, boy, right. As a witty writer lately hath said "God Almighty first planted gardens, and indeed it is the purest of human pleasures." But thou talkest. Hast no stomach for thy food, lad? Come, to dinner to dinner!

Indeed uncle, I am hungry.

Thou comest from a hungry land lad! What says the parson? *

"The situation of our region, lieng neere unto the north, dooth cause the heat of our stomaches to be of somewhat greater force: therefore our bodies doo crave a little more ample nourishment, than the inhabitants of the hotter regions are accustomed withall, whose digestive force is not altogither so vehement, bicause their internall heat is not so strong as ours, which is kept in by the coldnesse of the aire, that from time to time (speciallie in winter) dooth environ our bodies."

But fall to, fall to! My uncle's table is served so brave as a nobleman's, fowl wild and tame, homebred and foreign, and potatoes I trow! I see jellies, and marchpaine, sugar bread, conserves, and what not?—all on silver dishes—My uncle, I promise me, hath "a musicall headed French cook." And mark, there is the old plate in the cupboard which is lined with silk, and laid out with fine cloths and napery, but at table is naught to drink from save this new Venice glass from Murano, of fantastic shapes, and iris colours. We take our glass when we be thirsty, and having drunk replace it in the Cupboard. This, perforce, preventeth idle tippling. But I must have that glass again. That's a rare wine uncle!—Well spoken, boy—'twas pressed

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* Chapter vi. on the Food and Diet of the English is a capital one. Of the Scots in old times he writes:

In old times these north Britons did give themselves universallie to great abstinence, and in time of warres their souldiers would often feed but once or twice at the most in two or three daies (especiallie if they held themselves in secret, or could have no issue out of their bogges and marises, through the presence of the enimie) [and] in this distresse they used to [eat a certeine kind of confection, whereof so much as a beane would qualifie their hunger above common expectation. In woods moreover they lived with hearbes and rootes, or if these shifts served not thorough want of such provision at hand, then used they to creepe into the water or [said] moorish plots up unto the chins, and there remaine a long time, onelie to qualifie the heats of their stomachs by violence, which otherwise would have wrought and beene readie to oppresse them for hunger and want of sustinance."

in thy grandad's days, consule Henrico Octavo. 'Tis called Theologicum, for in the old days the wine merchant thought he might scarce save his soul alive unless he had served the clergy with the best. There then, uncle, gossip Hicks at home, albeit, yeoman like, he hath ever his piece of meat and cup of wine, would say "I have dined so well as my lord mayor!"

And now 'tis half-past two of the clock. Let us to the Playhouse. Ah! there is the flag flying. We will not be of the groundlings, and pay our penny for standing in the pit. 'Tis there all open to the sky. We may not see well from the galleries. Let us be choice and stand our 3d for a Room or Box, Well, here we are. The stage is strewn with rushes, there is a black curtain which betokens a Tragedy to be enacted. Those seated in chairs on the stage are the gallants. Non cuivsis contingit! The house is full, the spectators in their places, the more part smoking the Indian herb Tobacco, many with bottled ale beside them. Below the stage are the musics, trumpet, cornet, organ, viol, hautboy, recorder. Soft! Enter a Dansor in Black. That is the Prologueo. A large board bears the Title, "Elsinore. A platform before the Castle." It is the tragedy of Hamlet, Prince of Denmark. An excellent piece of work, I assure you. And the players, who are they? My uncle cannot name them all, but, when the play is at an end, we note a wit or critic remaining after the rest. He knows them all. Cowley, and Burbage, and Tarleton. "And the ghost, did you mark him?" Yes, yes, a goodly man of halting gait, with smooth brow and auburn beard. Methought he spoke it trippingly on the tongue." "That is Will Shakspere himself, who writ the piece. You shall ever see the house full when 'tis known one of his pieces will be presented. This age hath many an Aeschylus, and many an Aristophanes to boast of. There's Ben Jonson, a man of pretty wit and ripe scholarship. He hath made histories Sejanus, Catiline, and excellent comedies, the Fox, the Alchymist, but, an ye will hear, I shall rehearse you some lines by one of our fellows, Leonard Digges. He hath a sharp lad, Dudley Digges, will be a notable lawyer one day. Well thus Leonard saith of Will Shakspere—

"So have I seen, when Cæsar would appear,
And on the stage at half-sword parley were
Brutus and Cassius, O, how the audience
Were ravish'd! with what wonder they went thence!
When, some new day, they would not brook a line
Of tedious, though well-labour'd, Catiline;
Sejanus too was irksome: they priz'd more
Honest' Iago, or the jealous Moor.
And though the Fox and subtle Alchymist,
Long intermitted, could not long be miss'd,

Though these have sham'd all th' ancients, and might raise
Their author's merit with a crown of bays,
Yet these sometimes, even at a friend's desire
Acted, have scarce defray'd the sea-coal fire
And door-keepers: when, let but Falstaff come,
Hal, Poins, the rest,—you scarce shall have a room
All is so pester'd: Let but Beatrice
And Benedict be seen, lo! in a trice
The cockpit, galleries, boxes, all are full,
To hear Malvolio, that cross-garter'd gull.
Brief, there is nothing in his wit-fraught book,
Whose sound we would not hear, on whose worth look,
Like old-coin'd gold, whose lines in every page
Shall pass true current to succeeding age."
How like you the lines? Farewell my Masters! God be with you all!"

NOTE ON THE MAP OF LONDON.

The accompanying sketch gives the main outlines of the city and suburbs as shown in the map of London, drawn by Norden in 1593.

The old battlemented walls appear to have reached from Newgate to Aldgate, with two gaps between Newgate and Cripplegate.

Along the north bank of the river are several interesting places, which may be briefly noticed, commencing from the west.

Leicester House, the seat of Elizabeth's two favourites, Leicester and Essex. At Leicester's death, in 1588, it passed to his stepson, Essex. It was a pre-reformation building, having originally been the inn of the see of Exeter.

Whitefriars, the Alsatia of old London.

Bridewell, a palace in the time of Henry VIII, a house of Correction in the reign of Elizabeth.

Blackfriars, the scene of Queen Katharine's trial. Within its precincts lived several of Elizabeth's courtiers. Blackfriars theatre was opened in 1596, where Playhouse yard now stands.

Baynard's Castle owed its name to a follower of the Conqueror. It subsequently was forfeited to the Crown. It was here that Buckingham offered the Crown to Gloster.

Queenhithe, more anciently Eldred's hithe. From this Essex, in 1601, finding his cause hopeless, and his retreat cut off, took boat to his own house and fortified it.

Shrewsbury House was of great antiquity. It became the property of the Shrewsbury family in the reign of Edward VI. It was pulled down in 1600.

The old Swan was the point where it was the custom to land, in order to avoid shooting the narrow arches of old London bridge.

Old London Bridge was pulled down in 1822. The houses were removed in 1760. A full account of the bridge is given in Knight's London, Vol. I.

Billingsgate was a market for "fish, corn, salt-stores, victuals and fruit."

The Custom House marked on the map was built in the reign of Elizabeth, on the site of an older building.

The Traitor's Gate of the Tower is easily seen on the map.

S. Katharine's Hospital was removed to Regent's Park in 1825.

Old S. Paul's, as is well-known, was destroyed in the great fire. The spire fell in 1561. Up to that time it was the highest building in the world. Knight's London, Vol. IV., gives a full account of the old Church; Vol. II. of the present Church.

On the south side of the river, beginning with the west, is first the unsavoury marsh of Lambeth.

Paris Garden comes next, and the Bankside with the Bear-house, and the Play-house.

The Bear-gardens, in the reign of Henry VIII, were open on Sundays, the price of admission being one half-penny. The bears were baited with bull-dogs. The *Play-house* is the Rose Theatre, opened in 1592. The famous Globe was built in 1599 on the site of the Theatre in Shoreditch.

S. Mary's Overyes changed its name, at the dissolution of the religious houses, to the present S. Saviour's. It is one of the finest buildings of old London, containing, among many interesting monuments, that of the poet Gower. A full account of the Church will be found in Knight's London, Vol. I.

The introduction of the monster below bridge is not strictly accurate in point of date, place, and (probably) proportion—

The following extract from Harrison's Chronology will however explain: 1573. A monstrous fish is taken in Thenet upon the xjth of July, of 66 foot in length, and the diameter, or thicknesse thereof, full two yardes, or 6 of our English feete.

TWENTY-SIXTH HALF-YEARLY

REPORT

OF THE

MARLBOROUGH COLLEGE

Natural History Society,

(FOUNDED APRIL 9th, 1864),

FOR THE

HALF-YEAR,

ENDING CHRISTMAS, 1877.

"Tum mihi Naturæ libeat perdiscere mores:
Quis Deus hanc mundi temperet arte domum."

MARLBOROUGH:
PRINTED BY PERKINS AND SON, "TIMES" OFFICE
1878.

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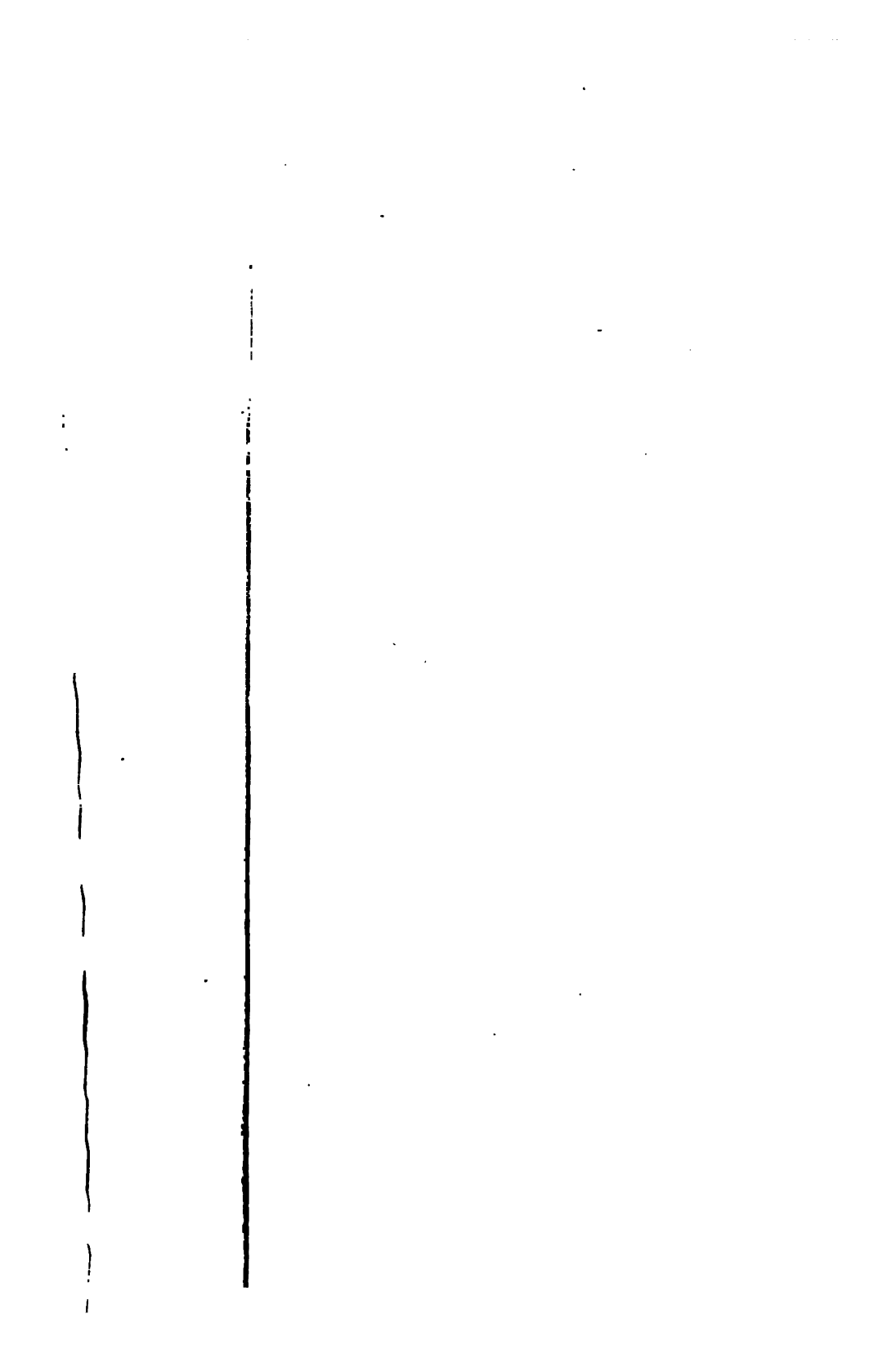

CONTORNI
DELL'
ETNA
1:300,000
Miglio Italiano di passi 2500.
Spiegazione de' nomi abbreviati
al Ovest
del gran Cratere
Fo. Monte Fontanedda
F. . Ferrare
G. . Gallobianco
T. . Testa
V. . Vituddi
(Cr.=Cratere nuovo.)
al Süd:
St. Sciarissima
Ca. M. Capriolo
L. . Lardizzazo
Co. . Conciolo
SF. Serra di Falco
VD. Vallone Demone
SN. M. S. Nicola
PL. Piano del Lago.
Granili
Mongialli
Gallodoro
Mola
S. Andrea
Scuto
Calcampiano
Diana
Lava d.
1381
Borgo
Porto di Greta
Cefali
Lava
del 1669
Carmine
Stesicorea
CATANIA
1: 50,000
Lava del Fortino
n. Siracusa

Theocles B.C. 735.

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PREFACE.

THE Winter Term is never very productive of much work in Natural History, and the present one has been no exception to the rule. In fact the *practical* work done by Members has been absolutely nothing, though it would have been very desirable to have been able to record a few Ornithological Notices. The Botanical List is very full, owing to the exertions of the REV. J. SOWERBY, who has not only made very careful search for all plants in flower, but has also added a few new species to our lists.

At the commencement of the term, it was decided to give up the Botanical Garden, for the present, but at the same time to make such arrangements that, if at any future period it seemed likely that it would become serviceable to Members, it could be taken back again. So little interest was taken in its maintenance, that the Committee did not feel justified in incurring the expense of having a man from time to time to keep it in order.

As the expenses connected with the Garden have now ceased, it has been decided to make the subscription for Members 2s. 6d. their first term, and 1s. every subsequent term, instead of 2s. a term as heretofore.

The large number of Members at the end of last term was considerably diminished, as was to be expected, at the commencement of the present one; in fact, 57 out of the 85 resigned, whilst 13 new Members have joined the Society. The number of Members is therefore 41, a very satisfactory number, and at the same time quite as large as we can wish or even expect to have.

The attendance at meetings has been good, and we have been honoured with the presence of several ladies. W. M. H. MILNER read a paper on "A Botanical Walk Round Marlborough," which interested many who heard it. Mr. BAMBRIDGE kindly gave a lecture on "Harmony," which was very

well attended, and an abstract of which appears in the Report. The other two evenings were taken up with Mr. RODWELL'S paper on "Etna," which the Committee venture to think will form one of the most valuable they have ever yet published.

The sketches for this paper have been drawn by W. H. M. D'URBAN, from those given in Dr. BALTZER'S Wanderungen am Ætna; the Map has been enlarged by Photo-lithography, from the one in BAEDECKER'S Guide; and the view of the Theatre of Taormina is taken from a Photograph by the Woodbury process, the negative being kindly supplied by Mr. CHIVERS.

The Museum has been enriched by a few donations, a list of which will be found in the proper place. The Committee here beg to return their thanks to the Donors for their kindness.

The Collections have far out-grown the space available for their proper exhibition, and steps are being taken to render them as accessible to Members as possible; but this takes time, and hitherto but little progress has been made, but it is hoped that ere long we shall have the objects so secured, that the moving of the trays necessary for seeing them will not displace them as at present.

Though, therefore, the Society cannot be said to have made very much progress, still it has not receded; there are some Members of the School who take a real interest in its welfare, and provided we can show *some* amount of progress every year, it is as much as we can expect to do; and if it can serve as a means of keeping up an interest in Natural History in the few who care for it, its aim will be fully answered.

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H. D. Drury, Esq.
Rev. C. Soames.
H. P. Dixon, Esq.
W. A. Clarke, Esq.
Rev. W. M. Furneaux.
Rev. A. C. Smith.
J. B. Fuller, Esq.
A. E. Garrod, Esq.
T. O. Harding, Esq.
Rev. G. C. Bell.
W. W. Goodchild, Esq.
L. E. Upcott, Esq.

Members:

W. M. H. Milner
J. H. C. Dalton
G. R. Rogers
E. G. Waddilove
R. B. Dods
A. E. Aldworth
C. B. Stewart
J. A. H. Cranfurd
H. D. Rolleston
E. N. Gardiner
W. H. Chappel
F. W. Nott
F. S. Alston
H. R. Hordern
W. H. M. D'Urban
E. M. R. Cox
G. C. Alston
C. H. Villiers
O. Elton
S. R. Baker
S. A. Pearse
C. E. Pine-Coffin
R. B. Thompson
A. L. Wright
F. S. Robinson
A. H. Davis
W. D. H. Petter
E. C. Vincent
E. T. Sankey
D. M. Wauchope
D. A. Hailes
A. Meyrick-Jones
G. B. Routledge
J. P. Clarke
B. V. Johnson
S. Grant-Dalton
E. F. Griffin
L. C. R. Thring
C. M. Stephenson
D. B. Thomson
P. A. Butler

EXTRACTS FROM THE RULES.

That this Society be called the Marlborough College Natural History Society.

Constitution.

That the Society consist of Members and Honorary Members.

Officers.

That the Officers of the Society consist of a President, Secretary, Treasurer, Librarian, and Curator.

Election of Officers.

That the President have the absolute power of nominating the Secretary.

That those Members of the Committee, who are not ex-officio Members, be elected terminally, and that the retiring Members be eligible for re-election.

That the same rule apply to the Treasurer, Librarian, and Curator.

Management.

That the affairs of the Society be conducted by a Committee, consisting of the President, Secretary, Treasurer, and three other Members of the Society, to be elected from and by Members of the Society; three of whom shall form a quorum.

President.

That in case of an equality of votes, the President shall have a double or casting vote.

Secretary.

That the duty of the Secretary be to summon meetings (when necessary) of the Society; to keep a detailed report of the proceedings, as well as lists of Members and Visitors present at each meeting, and generally to act under the direction of the Committee in all matters connected with the welfare of the Society.

Librarian.

That the duties of the Librarian be to keep a Catalogue of the Library, with the names of the donors, and to see that the Library Regulations are carried into effect.

Curator.

That the Curator be responsible for the order of the Museum.

Library.

That any Member of the Society be at liberty to consult any of the books belonging to the Society, but that only certain volumes, to be decided on by the Committee, be allowed to be taken from the room.

That members of the Society be permitted to use the Museum at such hours as the Committee shall appoint; but that in the afternoon it be used exclusively for the purposes of Natural History.

Field Days.

That the Field Days be confined *entirely* to Members of the Society, and that the President appoint a day on which names must be given in.

Members.

That the election of new Members rest entirely with the Committee.

That every member pay a subscription of 2s. 6d. his first term, and 1s. every subsequent term.

That if a Member be elected after the commencement of the term, the amount of his subscription for that term shall be settled by the Committee.

That Members have the right to introduce two visitors at all general meetings of the Society; to have personal access to the Museum, and to introduce a visitor at such times as shall seem fit to the Committee.

Honorary Members.

That Honorary Members have all the privileges of Members except the power of introducing a Member of the School to the meetings of the Society.

That Honorary Members pay 5s. a half-year, for which they shall be entitled to a copy of the Report.

That Honorary Members may compound for all future subscriptions by the payment of a sum of two guineas.

Suspension of Members.

That any member be liable to be excluded from the Society by the Committee, if, in their opinion, he shall have failed to show sufficient energy in the working of the Society.

Sections.

That the Society consist of sections to be formed for the more accurate study of the different branches of Natural History, and that every Member must belong to a Section.

That the question of the number of Sections be left open for settlement at the beginning of each term.

New Rules.

That any member of the Society have power to propose any new rule or any alteration in an old one, provided the motion be seconded by another Member.

MEETING HELD SEPT. 20TH, 1877.

In accordance with a decision of the Committee, it was announced that the Botanical Garden would cease to be accessible to Members. The cost of keeping it up was far greater than seemed desirable, considering how very little it was used or attended to by members of the Society.

"Land and Water," "Science Gossip," and "Nature," were asked to be taken in.

Meetings were fixed for Thursday, Oct. 4th, 25th; Nov. 15th and Dec. 6th.

The following donations were exhibited, and thanks ordered to be given to the donors.

Publications of the United States' Geological Survey, by the Director.

Selenite by H. D. Rolleston.

Specimens of Lava from Etna by G. F. Rodwell, Esq.

A collection of sea-birds' eggs by P. C. Atkins.

Mummy crocodiles, by A. Meyrick-Jones.

There were 2 Hon. Mems., 26 Members present.

MEETING HELD OCT. 4TH, 1877.

W. M. H. Milner read the following paper on "*A Botanical Walk Round Marlborough.*"

This gave rise to a discussion as to where some of our commoner plants could be obtained in any abundance. F. E. Hulme, Esq., also mentioned the following plan for keeping snowdrops in perfection for 3 or 4 weeks. Take them up just before the flowers open; put them in a soup-plate, or other deep vessel, and cover up well with moss, which keep damp.

G. R. Rogers was elected Librarian, in the place of G. P. V. Hume, resigned.

There were 41 persons present. 2 Hon. Mem., 1 visitor and 38 members of the School.

A fine specimen of "Venus' Ear," and a stalagmite from Kent's Cavern were presented by W. H. M. D'Urban, and a specimen of the Colorado Beetle by A. Meyrick-Jones.

A BOTANICAL WALK ROUND MARLBOROUGH.

When we have Mr. Preston presiding at our meeting, it may seem rather presumptuous for anyone else to read a paper on the flora of Marlborough. Accordingly I must say a few words by way of preface and explanation.

We cannot but admit that we have for some time depended too much on the kindness of Masters for papers, Mr. Preston in particular having had frequently to volunteer his services, when no other paper was forthcoming. We should any of us learn more if we had to work up the various subjects for ourselves by actual observation and making notes, such as might be made the basis of an occasional paper. Those who do so would encourage the rest to take a greater interest in the Natural History of the neighbourhood, and help such of them as may wish, hereafter, to study it with the attention it deserves. Such must be my excuse for undertaking to give a lecture on the Botany of the district, and I hope that others will follow me with papers on the Ornithology, Entomology, and Geology, in which we may point out the various peculiar features, the habitats of remarkable species, and the best seasons for working in the different branches. By this means some of the beauties of our Natural History—whether as regards flowers, birds, butterflies or fossils—may be revealed to beginners, and all may perhaps be incited to exert themselves on behalf of so noble a science, and do something creditable for what is professedly the Marlborough College Natural History Society.

First then I must ask your attention, while I take you on one of the best Botanical Expeditions that can be made in the immediate neighbourhood of Marlborough. We will leave the College by the Bath Road and turn off by the path to Preshute, noticing any of the more prominent plants as we go. Before reaching the bridge, on the right may be seen the erect stems of the Water Horse-tail (*Equisetum limosum*), each terminated by a curious head of brown or yellow fructification. In the hedge to the left you may note the drooping white or pink flowers and tapering leaves of the common Comfrey (*Symphytum officinale*), a plant which must not be gathered without caution, "on account of the bristles, which beset both stem and foliage."

Crossing the bridge we pass beneath some fine specimens of the Horse-Chesnut (*Æsculus Hippocastanum*) which displays its pretty spikes of white flowers during the months of May and June: this tree is not considered to be a true native of the British Isles, although it may be seen, in places, apparently as wild as the beeches of our forest, or the elms which grow by the side of every road.

We must now leave Preshute by the path leading to the White Horse Hill, and between the last two stiles observe to the right the beautiful blue flowers

of the Field Geranium (*G. pratense*) so well depicted by Mr. Hulme in "Familiar Wild Flowers."

The path now turns to the right and leads over the down towards Manton Copse, skirting a hedge, which, during the spring time, is quite a paradise of blue bells, primroses and anemones.

At length after crossing a few ploughed fields and a road, we reach the small remnant of Manton Copse, which once covered far more ground than at present, and which is one of the nearest localities for the wild strawberry, although you will find it much more plentiful in the neighbouring vast extent of copse land called the West Woods.

Here during the early summer is to be found the sweet woodruff (*Asperula odorata*), described by Miss Pratt in her popular Botany as having "bright green stems surrounded by coronals of richly verdant leaves, and surmounted in May by beautiful little clusters of blossom. The small flowers, white, or slightly tinged with pink, seem firm and compact as if cut out of wax. The leaves are deliciously fragrant with the odour of newly mown hay, but this is scarcely perceptible, while the plant is growing. When gathered, the warmth of the hand soon brings forth the aroma, and the dried plant will retain its odour for many years."

Here too in May and June you may see the bright green leaves and the nodding waxen white flowers of the Common Solomon's Seal (*Polygonatum multiflorum*) a plant which belongs to the same Natural Order as the lovely Lily of the Valley of our gardens. Having investigated the flora of Manton Copse, we will descend the hill and skirt the West Woods, leaving them for another day: the road leads us past Clatford Park farm to the Pewsey Road not far from Oare Hill; this, after a few hundred yards, brings us to a green lane turning off to the left and leading to the top of Martinsell, a spot any of you should visit, who have not already done so, as it is within easy walking distance, and affords an exceedingly fine view of the picturesque vale of Pewsey. On Martinsell itself there is no definite path to follow; we may keep to the top and walk along the worn rampart of the ancient British Camp, or we may explore the slope, perhaps the best way from a botanical point of view; or we may descend and keep along the bottom; only the latter entails the necessity of getting up again, which is rather stiff work on a hot July day.

Martinsell is the home of the Orchis Family, that most remarkable of all the natural orders, the peculiarities of which were pointed out by Mr. Preston in the interesting lecture, which some of you heard last term.

Amongst the different species I may mention the Dwarf Dark Winged Orchis (*O. ustulata*), which "is readily distinguished by its low growth, and dark brownish-purple flowers, in some specimens so dark, that before the flowers are fully expanded, they look as if they had been blackened by a

scorching flame." This curious plant, which grows to a height of only about four inches, you may see in flower during the months of May and June.

Another species is one which is of most common occurrence—the Spotted Orchis (*O. maculata*), a plant readily known by its delicate lilac flowers, which expand in June and July, and the purple spots on its lower leaves, from which it derives its name.

The chalky soil of Martinsell rears in profusion one of the most lovely of the family—the Pyramidal Orchis (*O. pyramidalis*), so named from the appearance of the broad clusters of crowded flowers of a rich crimson hue, and marked by a long slender spur.

Another frequent inhabitant of these slopes is the Fragrant Orchis (*Gymnadenia conopsea*), with deep rose-coloured flowers and a most delicious scent; it is often found in company with the species last described.

At the foot of Martinsell we may see the singular Butterfly Orchis (*Habenaria chlorantha*), which rears its spikes of white or greenish flowers from June to August, they however scarcely suggest the idea of a broad-winged butterfly.

Leaving the Orchis Family, which has been monopolising so much of our time, let us note some of the other botanical features of this great chalk escarpment. Abundant in a hedge at the foot of Martinsell is a climbing plant, variously known as Traveller's Joy, and Old Man's Beard, (*Clematis Vitalba,*) the wild form of the beautiful garden Clematis. It is, however, very seldom in flower before we leave for the holidays: in 1870 it was only just in blossom by July 16th.

Scattered about the slopes are clumps of dwarf Juniper (*Juniperus communis*), a plant which gives forth a powerful aroma when bruised; its small inconspicuous flowers change into berries of a dark purple hue. The sharp points of the stiff leaves deserve Spenser's description;

"Swete is the juniper, but sharp his bough."

Everywhere on the side may be seen the pretty blue flowers of the Milkwort (*Polygala calcarea*), several rare forms of which have been recently discovered on Martinsell; I am sure Mr. Preston will be glad if any of you will bring specimens of the plant from Martinsell for examination.

On the top near the ancient British earthwork flowers a most beautiful but exceedingly diminutive Forget-me-not (*Myosotis collina*) as well as the larger species (*Myosotis versicolor*); the flowers may be seen during the early summer, yellow at first, then changing to blue, both colours being visible on the same plant.

There now remains to be mentioned a great rarity, the Wild Tulip (*Tulipa silvestris*), the yellow flowers of which have been seen in a field near Martinsell, but the plant is most probably an escape from some garden. If we look at our watches now we shall probably find that it is well past five

o'clock; so as we wish to investigate the flora of the Railway, it is time to leave Martinsell. I may here mention that the whole of this programme cannot be carried out by those who have to be back by half-past five on half-holidays; however, Martinsell can always be visited as long as you do not botanize on the way.

Turning our backs on Martinsell we must follow the road over Clinch Common, where the Wild Raspberry (*Rubus Idaeus*) mingles with bushes of golden furze (*Ulex Europaeus*), and after a few hundred yards turn off to the right along a green lane, leading past a large pond to the Railway.

Soon after gaining the line we may see on each side the Hop Trefoil (*Trifolium procumbens*), one of the few yellow clovers. After the cutting is cleared, on the right slope of the embankment there are a few specimens of the Columbine (*Aquilegia vulgaris*), not however the true wild form, the flowers of which are single and often of a blue colour, but the ordinary double form of the gardens, being most probably an escape.

Here and there between the rails we may see the tiny purplish flowers of the Least Toad Flax (*Linaria minor*) borne from May to October on a small stem only from 4 to 10 inches in height. Some way down the embankment close to the archway near Granham Farm grows a plant of the Viper's Bugloss (*Echium vulgare*); one of the most brilliant of wild flowers, rising to a height of 2 or 3 feet, "with a spike of flowers more than a foot long.....The colour of these bells varies from the richest and most intense violet-purple to a pale blue or bluish-pink." It is described as "a rough and prickly plant tearing the wing of bee or butterfly, which on their way to its honied bells, pass too near their prickly cups, or inadvertently touch the stem or leaf." The plant received its name from those who thought that, "the spotted stem indicated that the Bugloss had been especially created to cure the bites of the speckled Viper; and its seeds, shaped, as they fancied, like a Viper's head, confirmed the promise of the stem." Proceeding further, the right side of the embankment is covered with the woolly-leaved plants of the Great Mullein (*Verbascum Thapsus*), with their tall tapering spikes of yellow flowers; it is described in the different Botanies as growing to a height of 4 or 5 feet, but this summer I saw a gigantic specimen, which, luxuriating in garden soil, had exalted itself till it was 9 feet high, truly justifying its title of Great. We must now hurry through the last cutting; then go down the steps to the left and gain the Pewsey Road. If there is any time to spare, the showy flowers of the yellow Iris or Water Flag may be seen to the left over the bridge. This and other species were the originals of the Fleur-de-Lys, the emblem of the French monarchy, known too at Marlborough College as the badge of one of the divisions of the Old House. We then get back to the College, most probably rather tired, but only with the tiredness, which is the result of healthy exercise. I think a walk in the direction I have denoted will be the

most profitable that can be taken in the immediate neighbourhood of Marlborough, and I hope some of you may be induced to take it and other botanical walks next summer term.

The walk might be varied, by either going to Martinsell, or returning by the Pewsey road. I will mention any flowers to be found near it, not merely during the summer term, but at different periods of the year. The copse to the left after reaching the top of the hill, and which gives access to the railway, is, during the early-spring, white with the star-like flowers of the wood anemone, the colour of which, however, is not constant, sometimes being a delicate crimson, and occasionally a pale sky-blue. The same copse in the summer, is the home of one of the most remarkable of the orchis family, the Tway-blade *(Listera ovata)*, the curious flowers of which, of a yellowish green colour, make it rather inconspicuous.

To the right, along the hedge bank running along the north of the down may be seen in May and June the "large milkwhite flowers of the Meadow Saxifrage *(Saxifraga granulata)*, a pretty plant, with slender leafy stems, ten or twelve inches in height."

Proceeding along the road, you may see, on the other side of the first hedge to the left, the beautiful purple flowers of the Greater Periwinkle (*Vinca major*), which expand in April. "It is a naturalised plant, often found in our woods, though generally near enough to houses to give good reason for believing, that it is the outcast of a garden."

You may go on a good way without observing anything particular, as far as an extensive chalk pit, in which may be found some more specimens of the flannel-leaved Mullein, which we met with on the Railway.

About a hundred yards further on, a road turns up to the right by the side of the Wansdyke, a mound composed of earth and stones, which formed the boundary-line of some ancient British tribe. A few yards up, to the left, the bank is covered with the broad bright green leaves of the Garlic or Ramsons, (*Allium ursinum*), which at a first glance may be mistaken for the foliage of the Lily-of-the-Valley; but the strong odour of the plant will soon remind you of the presence of Garlic; the pretty white star-like blossoms last from April to Midsummer.

The Wansdyke near the Railway is, in the early summer, covered with hyacinths, many with flowers of a pink or even white colour.

I will now mention a few more localities, which afford a good field for the botanist. The visit we promised ourselves to the West-woods will best be made towards the end of the Easter Term; this tract of copse-land may be reached with ease on any half-holiday, either by the path before described as a portion of the way to Martinsell, or by the Bath Road, turning off to the left opposite the Marquis of Ailesbury's Arms.

Access is afforded by a lane going up from the bottom of the hill below

Manton Copse, leading after a few hundred yards to a region of Daffodils.

"All at once," in the language of Wordsworth, you see a crowd,

"A host of golden daffodils,

. . . . beneath the trees,

Fluttering and dancing in the breeze."

A bouquet of these flowers looks exceedingly well in a study, or even in a dormitory.

A little further on is a place, where four roads, or rather lanes, meet; and taking the one to the right for a short distance, you come on an open space, blooming with countless Daffodils, Primroses, and Wood Violets.

In following the other approach to the West-woods, after leaving the main road, turn off along the second lane to the right, which leads over some pasture land, studded with the curious grey wethers, to a pretty glade with copse on either side. The rising ground to the left is very productive; there in summer rise the yellow spikes of the Wild Mignonette (*Reseda lutea*), a beautiful plant, although it has not the sweet scent of the garden variety. Here too grows the Common Solomon's Seal (*Polygonatum multiflorum*), the bright green leaves of which point in an opposite direction to the large nodding white flowers, tipped with green, which may be seen in May and June. The name is derived from some marks seen on the root-stock, the scars of previous flowering stems, and which seem as if it had been stamped with a seal; but why it should be "Solomon's" Seal is not so clear.

Another peculiar plant found in this spot is the Herb Paris (*Paris quadrifolia*), a very singular plant, the stem of which bears near its summit four broad leaves; from the centre of these rises the flower, which is partly green and partly purple. "Every part of the plant contains a poisonous principle, which is strongest in the berries." It is otherwise called *One-Berry* and *Truelove*, the reason for the latter name not being very evident; the name "*Herb Paris*" is taken from the Latin *par* "equal," on account of the regularity of the leaves and flowers.

The tract of down-land to the North of Marlborough is naturally not a good field for the botanist.

In that direction the only part worth visiting is the valley of the Og——. There in the months of June and July may be found the Yellow Meadow Rue (*Thalictrum flavum*), "a favourite herb with the old monks, never absent from the "physic garden" of the monastery. It was called Herb-of-Grace, because of its supposed virtues, and because it was mingled with the "holy water" used for sprinkling the congregation before and after service. Thus Ophelia says 'We call it Herb of Grace o'Sunday's.'"

The Mildenhall road leads to better ground. Just after leaving the town, at the bottom of the hill to the right, is some wet ground, where in the early spring you may look for the golden flowers of the Marsh Marigold (*Caltha*

palustris), which however does not so much resemble a starry Marigold, as a large thick buttercup. In the same place and about the same time you can see the broad leaves and the pale flesh-coloured flowers of the Butter-bur. (*Petasites vulgaris*).

Beyond Mildenhall, in a copse to the left of the road the shrubs are intertwined with ornamental festoons of the lovely wood-vetch (*Vicia silvatica*); "its beautiful white flowers, streaked with bluish veins, are very numerous and large." It justly ranks as one of the most elegant of our many beautiful wild-flowers.

Several miles beyond Mildenhall is the village of Axford, which contains some of the best botanical ground in the neighbourhood. A small marsh, about a quarter of an acre in extent contributes, amongst other specimens, the Marsh Orchis (*O. latifolia*) described above; also a species, by some considered a variety (*O. incarnata*) of the Marsh Orchis, but which has larger and paler flowers. According to Professor Babington it is "generally in perfection in the middle of June, when *latifolia* is past flowering." But this does not seem to be the case; actual observation shews that it is the earlier of the two, and it is in fact so stated in Professor Babington's earlier edition (vide 'Flora of Marlborough, p. 261).

Here too grows a most lovely plant, the Marsh-Trefoil or Bog-bean (*Menyanthes trifoliata*), with pinkish flowers, covered inside with a white silken fringe. "The whole raceme is not unlike a hyacinth at first." The flowers appear from April to June and again in September.

There now remains for examination the Forest, which perhaps contrary to expectation, proves to be almost the worst quarter of all. Fungi it produces in abundance, but flowers are scarce. However, one variety may be mentioned as occurring within its limits. In one spot between Savernake House and Great Bedwyn, grows the Rose-bay or French Willow (*Epilobium angustifolium*), a fine plant, growing from four to six feet in height, and "bearing showy pinkish-lilac flowers in August. Before coming into flower, it closely resembles the rods of a willow in the first year of their growth.

And finally, nearer home, on the Forest Hill, you may see the gay flowers of the Carline Thistle, which is distinguised from other English Thistles by its pale yellow coloured rays.

These are not by any means all the species that might be mentioned, but if you try to find them, you will discover many others at the same time, and you should certainly bring anything which seems strange. Either a small botanical tin or some specially prepared paper may be employed for carrying the plants, which should always be gathered as near the root as possible. Any of the localities mentioned will repay a visit, and any of them may be visited on a half-holiday. Some of you, I am sure, will take the necessary trouble, when you see that it must require some trouble to prepare

these papers, which are meant to help you towards a wider knowledge of Natural History.

Next term is the time for noticing the first flowering of many of the common plants, such as Buttercup, Marsh Marigold and Celandine; while many are to be found in flower at any season of the year, as the familiar Daisy and Dandelion, and the Dead Nettle! no date therefore is chronicled for their first flowering.

The Summer term is of course the one, in which the larger number of flowers come out; and then the superior attractions of cricket interfere; but you might try to employ an occasional half-holiday in this way; once or twice, I am sure you would be excused attendance in the Cricket field.

Appended to this is a list of the dates of flowering of certain plants, including those mentioned in my paper, with the localities of some.

JANUARY.

Furze (*Ulex Europaeus*).
Hazel (*Corylus Avellana*).
Snowdrop (*Galanthus nivalis*).
Localities—1. Field beyond St. Mary's Vicarage.
2. Field to the right of the Pewsey Road.

FEBRUARY.

Sweet Violet (*Viola odorata*).
Butterbur (*Petasites vulgaris*).
Coltsfoot (*Tussilago Farfara*).
Primrose (*Primula vulgaris*).
Daffodil (*Narcissus Pseudo-Narcissus*).
Localities—1. Various parts of the West Woods.
2. Near Oare Hill.

MARCH.

Wood Anemone (*A. nemorosa*).
Marsh Marigold (*Caltha palustris*).
Cowslip (*Primula veris*).

APRIL.

Buttercups (*Ranunculus bulbosus*).
Wood Violet (*Viola silvatica*).
Milkwort (*Polygala vulgaris*).
Several different forms of this are to be found on Martinsell.
Wild Strawberry (*Fragaria vesca*).
Localities—1. Abundant in the West Woods.
2. Hen's Wood.
Greater Periwinkle (*Vinca major*).
Bog Bean (*Menyanthes trifoliata*).
Locality—Marsh near Axford.

Comfrey (*Symphytum officinale*).
Herb Paris (*P. quadrifolia*).
Locality—West Woods.
Blue-bell (*Endymion nutans*).
Green-winged Orchis (*O. Morio*).
Early Purple Orchis (*O. mascula*).

MAY.

Dwarf Dark-winged Orchis (*O. ustulata*).
Spotted Orchis (*O. maculata*).
Marsh Orchis (*O. latifolia*).
Butterfly Orchis (*Habenaria chlorantha*).
Tway-blade (*Listera ovata*).
All the five preceding plants are to be found on Martinsell, the Marsh Orchis also at Axford.
Yellow Flag (*Iris Pseudacorus*).
Ransoms (*Allium ursinum*).
Locality—Wansdyke near the Pewsey Road.
Columbine (*Aquilegia vulgaris*).
Localities—1. West Woods (*single flower*).
2. Railway embankment (*double*).
Common Red Poppy (*Papaver Rhoeas*).
Wild Mignonette (*Reseda lutea*).
Locality—West Woods.
Meadow Crane's Bill (*Geranium pratense*).
Raspberry (*Rubus Idaeus*).
Locality—Clench Common.
Dog Rose (*Rosa canina*).
May or Hawthorn (*Crataegus Oxyacantha*).
Crab Apple (*Pyrus Malus*).
Elder (*Sambucus nigra*).
Sweet Woodruff (*Asperula odorata*).
Localities—1. Manton Copse.
2. West Woods.
Holly (*Ilex Aquifolium*).
Forget-me-not (*Myosotis palustris*).
Eye-bright (*Euphrasia officinalis*).
Juniper (*Juniperus communis*).
Locality—Martinsell.

JUNE.

Pyramidal Orchis (*O. Pyramidalis*).
Locality—Martinsell.

Fragrant Orchis (*Gymnadenia conopsea*).

Locality—Martinsell.

Wood Vetch (*Vicia silvatica*).

Localities—1. West Woods.

2. Copse near Mildenhall.

Blackberry (*Rubus discolor*).

Field Rose (*Rosa arvensis*).

Honeysuckle (*Lonicera Periclymenum*).

Hedge Bedstraw (*Galium Mollugo*).

Lady's Bedstraw (*Galium verum*).

Viper's Bugloss (*Echium vulgare*).

Locality—Railway Embankment.

Great Mullein (*Verbascum Thapsus*).

Localities—1. Chalk pit to right of Pewsey Road.

2. Railway Embankment.

Harebell (*Campanula rotundifolia*).

Locality—Common.

JULY.

Traveller's Joy (*Clematis vitalba*).

Locality—Hedge at foot of Martinsell.

Rose-bay (*Epilobium angustifolium*).

Locality—Forest.

AUGUST.

Meadow Saffron (*Colchicum autumnale*).

Locality—West Woods.

Heather (*Calluna vulgaris*).

SEPTEMBER.

Ivy (*Hedera Helix*).

MEETING HELD OCT. 26TH, 1877.

W. S. Bambridge, Esq., gave a lecture on Harmony, with copious illustrations on the piano.

There were 86 persons present.

MEETING HELD NOV. 15TH, 1877.

The President announced that in consequence of the Botanical Garden having been given up, it was proposed that for the future members should pay 2s. 6d. their first term and 1s. each subsequent term.

Also that a book would be placed on the table in the Museum for members to put down any suggestions for new books, &c.

G. F. Rodwell, Esq., then read the first part of his paper on Etna.

The following exhibitions were made:—

Fossil wasp's nest from America, by the President.

Quartz coated with oxide of iron, presented by

Plants from America, presented by an O.M.

There were 90 persons present. 6 Hon. Mem., 29 Mem., and 55 Visitors.

MEETING HELD DEC. 1ST, 1877.

In consequence of the day originally fixed for the meeting being so near the examination, the meeting was held on 1st Dec.

G F. Rodwell, Esq., finished his paper on Etna, which was illustrated by several maps, drawings, photographs and specimens.

The President exhibited some Truffles (*Tuber æstivum*) found in the West Woods; a monstrosity of a hen's egg presented by Mr. Rowe; some coal fossils, presented by Mr. Chivers; a small specimen of the shell *Chama gigas*; and a specimen of Brain coral (*Meandrina cerebriformis*) pierced with the shells of a *Magilus*, which according to Mr. Charlesworth, "is in fact a univalve Teredo, but a teredo that tunnels corals instead of wood."

After the general meeting there was a special meeting to pass the rule about the subscription of members, proposed at the last meeting; this was carried unanimously. E. M. R. Cox was afterwards elected Librarian.

There were 48 persons present. 6 hon. mem., 18 mem., and 24 visitors.

ENTOMOLOGICAL LIST.

The following list has been kindly supplied by N. Manders, Esq., one notice alone, that of *Pœcilocampa Populi*, by F. S. Alston, being supplied by members of the School

RHOPALOCHERA.

Gonepteryx Rhamni ...	... ...	Aug. 13.
Colias Edusa	... ...	about Sep. 28.
Pieris Brassicæ... ...	... ...	July 28.
P. Rapæ	... ...	July 28.
P. Napi	... ...	July 31.
Hipparchia Semele ...	... ...	Aug. 3.
Cynthia Cardui	... ...	Sep. 30.
Vanessa Atalanta ...	... ...	Aug. 5.
V. Io	... ...	Aug. 10.
V. Polychloros	... ...	Aug. 20.
V. Urticæ	... ...	Aug. 18.
Thecla Quercus	... ...	Aug. 20.
Polyommatus Alsus ...	Rabley	Aug. 20.
P. Agestis	... ...	Aug. 20.

SPHINGINA.

Acherontia Atropos ...	Sav. Forest	Mr. Coleman.
Sphinx Ligustri	larvæ	Oct. 1.
Macroglossa Stellatarum	larva	Sep., Mr. Coleman.

BOMBYCINA.

Hepialus Sylvinus ...	Sav. Forest	Aug. 25.
Cossus Ligniperda ...	at light	Sep. 3.
Orgyia Antiqua	eggs...	Dec. 8.
Pœcilocampa Populi...	at light	Nov. 14—Dec. 9.
Fumea Nitidella... ...	cases, Manton Copse ...	Aug. 18.

NOCTUINA.

Cymatophora Diluta...	abundant at sugar... ...	Aug. 27.
Acronycta Aceris ...	larva	Sep. 1.
Agrotis Suffusa	at sugar	Sep. 14.
Triphæna Fimbria ...	Sav. Forest; sugar ...	Sep. 14.
Orthosia Macilenta ...	... ...	Oct. 8.
Anchocelis Litura ...	at sugar	Sep. 14.
Cerastis Vaccinii ...	... ...	Nov. 5.
C. Spadicea...	... ...	Nov. 5.
Xanthia Flavago ...	... ...	Oct. 30.

Phlogophora Meticulosa	... ...	Nov. 5.
PLUSIA PULCHRINA ...	at flowers at dusk... ...	July 12.
P. Gamma	(bred)	Oct. 5.

GEOMETRINA.

Ennomos Tiliaria ...	at light	Sep. 10.
E. Fuscantaria	at light	Sep. 3.
Halia Wavaria	... ...	Sep. 13.
Cheimatobia Brumata	... ...	Nov. 5th—Jan. 2.
Oporabia Dilutata ...	... ...	Nov. 1.
Eupithecia Centaureata	at light	Sep. 5.
Scotosia Dubitata ...	at light	Sep. 6.
Cidaria Miata	... ...	Sep. 20.
C. Russata	... ...	Sep. 8.
C. Immanata	... ...	Sep. 3.

Plusia Pulchrina, formerly mistaken for Plusia Iota; probably not uncommon.

N. MANDERS.

BOTANICAL REPORT.

THE following Report may be considered to be due almost entirely to the exertions of the Rev. J. Sowerby, as before his visit to Marlborough very little indeed had been done. Walks were taken on September 5th, 8th, 18th, 25th, 27th, the two latter by W. M. H. Milner; and Mr. Sowerby's first Botanical Walk was taken on October 12th; and on October 15th, 17th, 19th, 20th, and 26th, and November 1st, 2nd, and 13th walks were also taken, the long break between the 2nd and 13th being caused by very wet weather; he then left Marlborough for a time, but returned so as to have a further search between November 26th and 30th. In the following table s, o, n, d signify that the plant was in flower September, October, and November, and on December 1st; a *number* indicates the date when last seen in flower, and a * that the species must have been in flower during that month, but was not observed, specimens found later on showing that it had only escaped notice. Thus

1. C. vitalba was in flower till October 15th.
13. R. fluitans „ November 2nd.
28. R. acris „ December 1st, at least.
98. A. Thaliana was found in flower in November, in such a state that it had evidently been in flower in October.
300. U. Europæus began to flower on November 14th, and continued till December 1st, at least.

It will thus be seen that there were in flower in 1877, 272 in October; 165 in November; 104 on December 1st; and comparing this with 1876—

Up to October 17th—134 were in flower.
November 1st—214 „
„ 9th—127 „
„ 15th— 64 „

And with 1875—

Up to October 15th—178 „
November 6th—69 „

Showing that plants lasted much longer in flower this year than last; though during the early part of November there were more in 1876 than 1877.

The following new species must be added to the list:—

Ranunculus fluitans—This must now, I think, be added; specimens sent last year to London were so marked, but the locality was not quite certain, the label having been lost. It has been observed again this year.

Senebiera didyma occurs as a casual on rubbish heaps.

Crepis setosa—A specimen found among corn.

Mercurialis annua—A casual on rubbish heaps.

All the above have been found by Rev. J. Sowerby, in the district surrounding New Mill.

Sagina apetala has at last been discovered on an old wall in Marlborough, but had escaped detection hitherto.

It may also be noticed :—

(1) The unusually late (or early?) specimen of *Draba verna*, found on October 19th.

(2) *Geranium Pyrenaicum* has been recorded for cultivatedspecimens.

(3) *Hedera Helix* began to flower on October 14th ; remarkably late.

(4) *Veronica hederifolia* lasted till October 26th.

(5) *Vinca major* and *Borago officinalis* lasted all the year in gardens, though not noticed in the table.

Clematis.				
Vitalba	s	15		
Ranunculus.				
fluitans	*	o	2	
c. penicillatus	7			
Flammula	*	o	2	
acris	s	o	n	1
repens	s	o	n	25
bulbosus	.	.	.	9
arvensis	*	o	n	1
Caltha				
palustris	18			
Papaver				
Rhœas	s	o	18	
dubium	*	o	2	
Argemone	*	o	2	
Chelidonium.				
majus	s	19		
Fumaria				
officinalis	s	o	13	
Raphanus				
Raphanistrum	s	o	n	1
Sinapis				
arvensis	s	o	n	25
alba	s	o	n	1
nigra	*	o	1	
Brassica.				
Rutabaga	*	o	2	
Diplotaxis.				
muralis	*	o	2	
Sisymbrium.				
officinale	s	o	n	1
Cardamine.				
hirsuta	.	.	26	1
Arabis.				
thaliana	*	*	n	1
hirsuta	*	15		
Nasturtium.				
officinale	s	o	2	
Draba.				
verna	.	19		
Thlaspi.				
arvense	*	19		
Capsella.				
Bursa-pastoris	s	o	n	25
Lepidium.				
campestre	.	.	n	
Senebiera.				
didyma	*	*	2	
Coronopus	*	*	2	
Reseda.				
lutea	s	20		
Helianthemum.				
vulgare	s	26		

Viola.
a. Riviniana 5
tricolor ..... * 19
b. arvensis ..... s o n 25
Polygala.
vulgaris ..... s o 2
Silene
inflata ..... s 15
noctiflora ..... * o 2
Lychnis.
vespertina ..... s o n 1
diurna ..... s o n 1
Flos-cuculi 26
Githago ..... s 16
Cerastium.
glomeratum ..... s * 13
triviale ..... s o n 25
Stellaria.
aquatica ..... * 19
media ..... s o n 25
graminea ..... s o 2
Arenaria.
serpyllifolia ..... * o n 25
b. leptoclados ..... * 15
Sagina.
procumbens ..... * 26
Spergula.
arvensis ..... * o 2
Spergularia.
rubra ..... * 16
Scleranthus.
annuus ..... * 20
Hypericum.
perforatum ..... s o 2
humifusum ..... * 16
hirsutum 27
Malva.
moschata ..... s o n 1
sylvestris ..... s o n 1
rotundifolia ..... s o n 25
Linum.
catharticum ..... s 12
Geranium.
pratense ..... s 19
pyrenaicum ..... s o n 1
molle ..... s o n 25
pusillum ..... * 15
dissectum ..... s o n 1
columbinum ..... s o n 1
lucidum ..... s o 10
Robertianum ..... s o n 1
Ulex.
europæus .... 14 d
Gallii ..... * o n 1
Anthyllis.
vulneraria ..... s 19
Medicago.
lupulina ..... s o n 1
Melilotus.
arvensis ..... * 19
Trifolium.
pratense ..... s o n 1
arvense ..... * o 2
hybridum ..... s 19
repens ..... s 19
procumbens ..... s o n 1
minus ..... s o n 1
Lotus.
corniculatus 18
Onobrychis.
sativa ..... s 15
Vicia.
hirsuta ..... s o n 1
tetrasperma ..... * 19
sylvatica ..... s 17
sepium ..... s o n 1
sativa ..... s o 2
Lathyrus.
pratensis ..... s 20
Spiræa.
Ulmaria ..... s o 2
Agrimonia.

Eupatoria ..... s o 14
Poterium.
Sanguisorba ..... s o 13
Alchemilla.
arvensis..... * * n 1
vulgaris..... * 19
Potentilla.
Tormentilla ..... s o 2
reptans ..... s 12
anserina 25
Fragaria.
vesca .... s o * 1
Rubus.
discolor ..... s 26
rudis ? .... * 17
corylifolius ..... s o 2
cæsius ..... s 19
Geum.
urbanum ..... s o n 25
rivale ..... * 20
Rosa.
arvensis..... . 17
Epilobium.
hirsutum 20
parviflorum ..... s 26
montanum ..... s 16
Bryonia.
dioica 5
Helosciadium.
nodiflorum..... s 19
Sison.
Amomum ..... * 16
Pimpinella.
Saxifraga ..... s o n 25
Sium.
angustifolium ..... s 15
Æthusa.
Cynapium ..... s o n 1
Silaus.
pratensis ..... * * 18
Angelica.
sylvestris ..... s o 18
Pastinaca.
sativa ..... s o n 25
Heracleum.
Sphondylium ..... s o n 1
Daucus.
Carota ..... s o n 1
Torilis.
infesta ..... * o * 1
Anthriscus ..... s o * 1
nodosa 25
Chærophyllum.
sylvestre ..... . o n 1
temulum ..... * o * 1
Scandix.
Pecten-Veneris..... * o n 1
Hedera.
Helix ..... . 14 n 1
Sambucus.
nigra 7
Lonicera.
Periclymenum ..... s 19
Galium.
cruciatum 27
verum ..... s 26
Mollugo..... s 26
Aparine..... s o n 25
Asperula.
cynanchica 5
Sherardia.
arvensis ..... * o 2
Valeriana.
officinalis ..... s 12
Valerianella.
dentata ..... * 16
Dipsacus.
sylvestris 27
pilosus ..... * 15
Scabiosa.
succisa ..... s 20
columbaria ..... s o n 1

arvensis ..... s o n 12

Carduus.

nutans ..... s o n 1
crispus ..... s o 18
lanceolatus ..... s o 18
eriophorus..... * 15
palustris ..... s 20
acaulis ..... s 15
arvensis ..... s o 18

Arctium.

majus ..... s o 1
minus 5
intermedium..... * 19
nemorosum ..... s 12

Centaurea.

nigra ..... s o n 1
Scabiosa ..... s o n 1
Cyanus ..... s o 2

Chrysanthemum.

segetum..... * o n 1
Leucanthemum ... s o n 1

Matricaria.

inodora ..... s o n 25

Tanacetum.

vulgare ..... * 26

Anthemis.

Cotula ..... s o * 1
arvensis ..... * * 2

Achillea.

Millefolium ..... s o n 25

Artemisia.

vulgaris..... 5

Filago.

germanica..... * 26

Senecio.

vulgaris ..... s o n 25
sylvaticus ..... * o 2
Jacobaea ..... s o n 25
aquaticus ..... s o n 25

Bidens.

tripartita ..... * 12

Inula.

Conyza .... * 15
dysenterica ..... * 12

Bellis.

perennis..... ..... s o n 25

Erigeron.

acris ..... * o * 1

Eupatorium.

cannabinum ..... s 20

Lapsana.

communis ..... s o n 1

Hypochoeris.

radicata..... s o n 1

Leontodon.

hirtus..... * o n 1
hispidus..... s o n 1
autumnalis ..... s o n 1

Picris.

hieracioides ..... * o n 1

Helminthia.

echioides ..... * o 2

Taraxacum.

officinale ..... s o n 25

Sonchus.

oleraceus ..... s o n 1
asper ..... s o n 1
arvensis ..... s 19

Crepis.

setosa..... * 12
virens..... s o n 25

Hieracium.

Pilosella..... * o 2
vulgatum ..... * 26
boreale ..... s 19

Phyteuma.

orbiculare ..... * 20

Campanula.

glomerata ..... s o n 1
Trachelium ... . s 20
rotundifolia ..... s o 18
patula .... s 19

Specularia.
hybrida ..... * * * 1
Calluna.
vulgaris..... * o 2 .
Erythræa.
Centaurium ..... s o 13
Gentiana.
Amarella ... . s 20
campestris ..... * o n 1
Convolvulus.
arvensis ..... s 12
sepium ..... s 19
Cuscuta.
europæa..... s 12
Solanum.
Dulcamara 27
Verbascum.
Thapsus..... * * 2
nigrum .... * 17
Scrophularia.
Balbisii ..... s 15
nodosa ..... s 17
Linara.
Cymbalaria ..... * 20 * 25
Elatine ..... * * n 1
vulgaris ..... s 15
minor ..... s 12
Veronica.
hederifolia ..... . 26 . 25
polita... ..... s o n 25
agrestis 5
Buxbaumii ..... s o n 25
arvensis ..... s o n 25
serpyllifolia ..... s o n 1
officinalis ..... * 16
Chamædrys ..... s 20
Anagallis ..... s 26
Euphrasia.
officinalis .... s 19
Bartsia.
Odontites .... s 26

Melampyrum.
pratense..... 5
Mentha.
hirsuta ..... s 15
arvensis ..... s 15
Pulegium ..... * 12
Thymus.
Serpyllum ..... s o 13
Origanum.
vulgare 19
Calamintha.
Clinopodium ..... s o 2
menthifolia ..... s 15
Salvia.
Verbenaca..... ..... * 15
Prunella.
vulgaris ..... s 26
Ballota.
nigra ..... s 17
Stachys.
Betonica ..... s 26
palustris 20
sylvatica ..... s 26
Galeopsis.
Ladanum ..... s 26
Tetrahit..... s o n 1
Lamium.
amplexicaule..... s o 1
purpureum ..... s o n 25
album ..... s o n 25
Ajuga.
reptans ..... s o 2
Teucrium.
Scorodonia ..... * o 2
Lithospermum.
arvense ..... * 26
Mysotis.
palustris ..... s 20
arvensis..... s o n 1
Anchusa.
arvensis... ..... * o * 1

Symphytum.
officinale ..... s 19
asperrimum ..... * o n 1
Primula.
vulgaris ..... . o n 25
Lysimachia.
nemorum ..... * 16
Anagallis.
arvensis ..... s o n 25
Plantago.
major 27
media ..... s 15
lanceolata ..... s o 2
Chenopodium.
album ..... s o 13
B. Henricus 5
Atriplex.
angustifolia ..... s o * 1
Rumex.
conglomeratus 15
nemorosus ..... s o 2
obtusifolius ..... s o n 1
crispus ..... s o n 1
Hydrolapathum ... 5
Acetosella 19
Polygonum.
Convolvulus ..... s 19
aviculare ..... s o n 1
Hydropiper ..... s o 2
Persicaria ..... s o 1
lapathifolium ..... s 19
Euphorbia.
Helioscopia ..... s o n 25
Peplus ..... s o n 25
exigua ..... s o n 1
Mercurialis.
annua ..... * o 2
Urtica.
dioica 18
urens ..... s o n 25
Ruscus.
aculeatus 25
Colchicum.
autumnale 5 26
Juncus.
lamprocarpus ..... * 12
bufonius ..... * 0 2
Phalaris.
canariensis ..... * 19
Alopecurus.
agrestis ..... s o n 1
pratensis 12
Phleum.
pratense 5
Agrostis.
vulgaris ..... s o * 1
Phragmites,
communis ..... s 12
Aira.
cæspitosa ..... s o 2
Avena.
flavescens ..... s o * 1
elatior ..... s o n 25
Holcus.
mollis 5
lanatus ..... s o n 1
Glyceria.
fluitans ..... * 26
plicata 5
aquatica 5
Poa.
annua ..... s o n 25
trivialis 26
Cynosurus.
cristatus ..... * o n 1
Dactylis.
glomerata ..... s o * 1
Bromus.
giganteus 20
asper ..... s . . 1
sterilis ..... * 20
mollis ..... s o * 1

Brachypodium.
sylvaticum ..... s o 18
Triticum.
caninum..... . . 14
repens .... s 20
Lolium.
perenne ..... s o n 25

ADDITIONS TO THE MUSEUM.

Specimen of Selenite	H. D. Rolleston.
„ Lava from Etna	G. F. Rodwell, Esq.
„ Stalagmite from Kent's Cavern ...	W. H. M. D'Urban.
„ Venus' Ear	„
Collection of Eggs of Sea Birds	P. C. Atkins.
Mummy of Crocodiles	A. Meyrick Jones.
Specimen of Colorado Beetle	

ADDITIONS TO THE LIBRARY.

Kingston's Western World	J. C. Priestley.
Macmillan's Footnotes from the Page of Nature	F. E. Hulme, Esq., F.L.S., F.S.A.
Flora of Marlborough, Ed. 2	
Official Report of the Arctic Expedition	A. J. Burness.
Guide to the Constellations	J. H. C. Dalton.
Philosophical Transactions of the Royal Society, Pt. 3 1853 to Pt. 1, 1860	Rev. G. C. Bell.
Gompertz on the Science connected with Human Mortality	"
Harcourt on the Laws of connection between the conditions of a chemical change and its amounts	"
Transactions of the Lennæan Society, vol. xix. part 4, to vol. xxiii. part 1	"
Transactions and Proceedings of the New Zealand Institute, vol 9	The N.Z.Institute.
Reports of the United States Geological Survey, with their Pamphlets, Bulletins, &c., as published	The U. S. Government.
Strachey's (Lieut.-General) Introductory Lecture on Scientific Geography	Rev. G. C. Bell.
Transactions of the Watford Nat. Hist. Socy., pt. 5, 6	The Society.
———————Rugby School N.H.S. for 1876	"
———————Wellington College N.S.S. for 1876	"
Zoologist, Popular Science Review, Wilts Arch. Magazine, Geological Magazine, Entomologist, Entomologists' Monthly Magazine, Monthly Microscopical Journal, Science Gossip, and Land and Water,	up to date.

STANTON PRIZES.

I.—The Subjects for the Stanton Prizes will be divided into two groups:

(i.) Botany and Physics.

(ii.) Entomology, Geology, and Ornithology.

II.—Candidates will have to pass a Preliminary Examination in the elements of their own subject, and of one other of the subjects set for that year; after which, *if passed satisfactorily*, they will be examined in their own special subjects.

III.—In addition to these two Examinations, a certain amount of practical work will have to be sent in.

IV.—The books required for the Preliminary Examination will be—

Botany—Oliver's Botany (chapters, 1, 2, 3, 8).

Physics—Balfour Stewart's Physics (1s. edition).

Entomology—Dallas' Elements of Entomology (chapters 1, 2, & 3).

Geology—Bonney's Manual of Geology (1s., published by S.P.C.K.), chapters 1 to 6.

Ornithology—Stanley's History of Birds (chapters 2 and 3).

V.—The special subjects and practical work shall be changed every year, and shall be given out as soon as possible after the announcement of the prizes gained for the previous year.

SUBJECTS FOR 1878.

The Prizes this year will be given for Botany and Physics.

(1.) *Preliminary* Examination, see rule iv.

(2.) *Special* Examination.

(*a*) *Botany*—Macmillan's "Footnotes from the Page of Nature."

(*b*) *Physics*—Frictionial Electricity; Tyndall's Lessons in Electricity.

(3) Practical Work.

(*a*) *Botany*—A collection of not less than 250 plants growing within 6 miles of Marlborough.

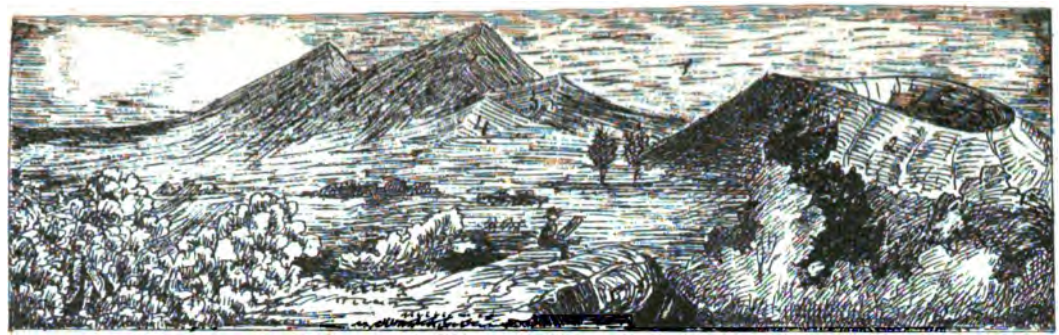
(*b*) Apparatus to illustrate Tyndall's Lessons. To be made by the Candidate.

GREAT CRATER MONTAGNUOLA. SCHIENA DEL ASINO.

ON THE ROAD TO THE SUMMIT. 3000 FEET ABOVE THE SEA.

1. MONTE GROSSO. 2. LAVA OF 1766. 3. MONTE FRUMENTO. 4. PIANO DEL LAGO.
IN THE FOREGROUND, LAVA OF 1537.

MONTE ROSSI



VIEW FROM THE HEIGHTS OF ETNA (3300 FEET) DOWNWARDS TOWARDS CATANIA.

1. PLAIN OF CATANIA. 2. MONTE RINAZZI. 3. MONTE FUSARA. 4. MONTE NOCILLA.

(From Dr. Baltzer's Wanderungen am Aetna.)

THE CASA DEL BOSCO, WITH THE GREAT CRATER IN THE BACKGROUND.

ETNA.

MOUNT ETNA, one of the most celebrated volcanoes in the world, is situated on the eastern sea-board of Sicily. Its position was first accurately determined by Captain Smyth in 1814, who found the long. east of Greenwich to be 15°, and the latitude of the highest bifid peak of the great crater to be 37° 43m. 31s. N. These results have been generally adopted. In the new Italian map constructed during the last ten years by the Stato Maggiore, the latitude of the centre of the crater is stated to be 37° 44m. 55s. N., while the longitude is 0° 44m. 10s. east of the meridian of Naples, passing through the Observatory of Capo di Monte.

Position.

Name.

There can be no doubt that the name of Etna—Αἴτνα—is derived from αἰθω, to burn. This name was known to Hesiod. Bochard has gone out of his way to show that it may possibly be derived from the Phoenician *Athuna*, a furnace, but we do not consider that his position is tenable. The more modern name *Mongibello*, by which the mountain is still commonly known to the Sicilians, is a combination of the Arabic *jebel* and the Italian *monte*. During the Saracenic occupation of Sicily, Etna was called *jebel uttamat*—the mountain of fire,—and the first syllables of *Mongibello* are a relic of the Saracenic name. There is a mountain near Palermo which bears the name of Jebel Rosso, the red mountain; and names may not unfrequently be found in the immediate neighbourhood of Etna which are compounded of arabic words or which are altogether unaltered, such as *Alcantara* the river of *the bridge*, a river which forms the northern boundary of the base of Etna. The mountain is also often spoken of distinctively as *Il Monte*:—*the* mountain *par excellence*, a name which in its capacity of the largest mountain in the kingdom of Italy, and the loftiest volcano in Europe, it fairly justifies.

Etna is often alluded to by classical writers. By the poets it was feigned to be the prison of the giant Euceladus or Typhon, or the forge of Hephaistos.

Pindar

Pindar (B.C. 522—442) in the first of his Pythian odes, for Hieron of the town of Aitna, winner in the chariot race in B.C. 474, exclaims:—

. . . "He (Typhon) is fast bound by a pillar of the sky, even by snowy Etna, nursing the whole year's length her dazzling snow. Whereout pure springs of unapproachable fire are vomited from the inmost depths: in the daytime the lava-streams pour forth a lurid rush of smoke: but in the darkness a red rolling flame sweepeth rocks with uproar to the wide deep sea. . . That dragon-thing (Typhon) it is that maketh issue from beneath the terrible fiery flood."

Æschylus.

Æschylus (B.C. 525—456) speaking also of the "mighty Typhon" (*Prometheus* V. Myer's translation) exclaims:—

"he lies
A helpless, powerless carcase, near the strait
Of the great sea, fast pressed beneath the roots
Of ancient Etna, where on highest peak
Hephæstos sits and smites his iron red hot,
From whence hereafter streams of fire shall burst,
Devouring with fierce jaws the golden plains
Of fruitful fair Sikelia."

Herein he probably refers to the eruption (B.C. 476) which had occurred a few years previously.

Thucydides.

Thucydides (B.C. 471—402) alludes in the last lines of the Third Book to several early eruptions of the mountain in the following terms:—"In the first days of this spring, the stream of fire issued from Etna, as on former occasions, and destroyed some land of the Catanians, who live upon mount Etna, which is the largest mountain in Sicily. Fifty years, it is said, had elapsed since the last eruption, there having been three in all since the Hellenes have inhabited Sicily."

Virgil.

Virgil's oft-quoted description of the mountain (Eneid Bk. 3) we give in the spirited translation of Conington:—

"But Etna with her voice of fear
In weltering chaos thunders near.
Now pitchy clouds she belches forth
Of cinders red, and vapours swarth;
And from her caverns lifts on high
Live balls of flame that lick the sky:
Now with more dire convulsion flings
Disploded rocks, her heart's rent strings,

And lava torrents hurls to-day,
A burning gulf of fiery spray."

Many other early writers speak of the mountain, among them Theocritos, Ovid, Livy, Seneca, Lucretius, Lucan, Petronius, Dion Cassius, Strabo, Diodorus Siculus, and Lucilius Junior. Strabo has given a very fair description of the mountain, and mentions that the upper of it part was bare and covered with ashes, and with snow in winter, while the lower slopes were covered with forests. The summit was a plain 20 stadia in circumference in the midst of which rose a small hillock. It was commonly ascended in his time. Lucilius mentions that people ascended to the edge of the crater, and offered incense to the tutelary gods of the mountain.

Strabo.

While the poets on the one hand had invested the mountain with various supernatural attributes, and had made it the prison house of a chained giant, and the workshop of a swart god, Lucretius and others endeavoured to show that the eruptions and other phenomenas could be easily explained by the ordinary operations of nature. These ideas were developed by Lucilius Junior (the friend of Seneca to whom he addressed his *Quæstiones Naturales*), in a poem consisting of 640 hexameters of not inelegant Latin, entitled *Ætna*.

Lucretius explains the more prominent phenomena of Etna in the following manner:—"And now at last I will explain in what ways yon flame roused to fury in a moment blazes forth from the huge furnaces of Aetna. And first the nature of the whole mountain is hollow underneath, underpropped throughout with caverns of basalt rocks. Furthermore in all caves are wind and air; for wind is produced when the air has been stirred and put in motion. When this air has been thoroughly heated, and raging about has imparted its heat to all the rocks around, wherever it comes in contact with them, and to the earth, and has struck out from them fire burning with swift flames, it rises up and then forces itself out on high, straight through the gorges; and so carries its heat far and scatters far its ashes and rolls on smoke of a thick pitchy blackness, and flings out at the same time stones of prodigious weight; leaving no doubt that this is the stormy force of air. Again the sea to a great extent breaks its waves and sucks back its surf at the roots of that mountain. Caverns reach

Lucretius.

from this sea as far as the deep gorges of the mountain below. Through these you must admit (that air mixed up with water passes: and) the nature of the case compels (this air to enter in from that) open sea and pass right within and then go out in blasts and so lift up flame and throw out stones and raise clouds of sand; for on the summit are craters, as they name them in their own language; what we call gorges and mouths." (Munro's translation.)

Many of the myths developed by the earlier poets had their home upon the very sides of Etna:—Demeter seeking Persephone, Acis and Galatea, Polyphemus and the Cyclops. Mr. Symonds (*Sketches in Italy and Greece*, p. 201) tells us that the one-eyed giant Polyphemus was Etna itself with its one great crater, while the Cyclops were the many minor cones. "Persephone was the patroness af Sicily, because amid the billowy corn-fields of her mother Demeter, and the meadow-flowers she loved in girlhood, are ever found sulphurous ravines and chasms breathing vapour from the pit of Hades."

It is said that both Plato and the Emperor Hadrian ascended Etna in order to witness the sunrise from its summit.

The story of:—

> "he who to be deemed
> A god, leaped fondly into Etna flames,
> Empedocles."

is too trite to require repetition.

If we pass now to more modern times we find mention of Etna by Dante, Petrarch, Cardinal Bembo, and other middle age writers. In 1541 Fazzello made an ascent of the mountain, which he briefly describes in the fourth chapter (entitled *De Aetna Monte et ejus ignibus)* of his work *De rebus Siculis*. He also gives a very brief history of the mountain.

Fazzello.

In 1591 Antonio Filoteo, who was born on Etna, published a work in Venice entitled: *Aetnæ Topographia, incendiorum Aetnæorum Historia*, in which he describes an eruption which he witnessed in 1536. He asserts that the mountain is divided into three "Regions," the first, very arid, rugged and uneven, and full of broken rocks; the second, covered with woods; and the third, cultivated in the ordinary manner. Of the height he says "Ascensum triginta circiter millia passuum ad plus habet." He makes a curious error as to the name *Mongibello* which he derives from *Mulciber*, one of

Filoteo.

the names of Vulcan, who was supposed by the ancients to have his forge in the mountain.

Carrera gave an account of Etna in 1636; the Jesuit Kircher in 1638; and Massa in 1708. The great eruption of 1669 was described at length by the naturalist Borrelli in the year of its occurrence. It was also described by some Englishmen in the *Philosophical Transactions;* and by the Earl of Winchelsea, our Ambassador at Constantinople, who was returning to England by way of the Straits of Messina, at the time. As this was the most considerable eruption of modern times it attracted a good deal of attention. A map in the *Bibliothèque Nationale* in Paris gives an imaginary view of the mountain during this eruption. It is entitled "Plan du Mont Etna communement dit Mount Gibel en l'Isle de Scicille et de t'jncêdie arriue par un trèblement de terre le 8me mars dernier 1669." Further in the Sacristy of the Cathedral of Catania there is a curious wall painting representing broad red streams of lava descending from the Monti Rossi and overwhelming the city.

Eruption of 1669.

In a "new map of Italy published in 1714 by H. Moll, Geographer in Devereux Court, Strand, there is a representation of Etna during the eruption of 1669. Over against the cost of Sicily and near the mountain is written: "Mount Etna or Mount Gibello. This mountain sometimes issues out pure flame, and at other times a thick smoak with ashes; streams of fire run down with great quantities of burning stones, and has made many eruptions."

Towards the middle of the next century, the mountain was ascended and described by Count D'Orville (1727); by the German Riedesel in 1767, and by Sir William Hamilton, then our Ambassador in Naples, in 1769. During the twenty years which followed the latter date, it was described by Borch, Swinburne, Denon, Spallazani, Faujas de Saint Fond, and Houel. The latter in his *Voyage pittoresque dans les Deux Siciles* 1782—1786, has given a capital account of the mountain, accompained by some excellent engravings.

In 1776 a clever Irishman named Patrick Brydone, published two volumes of a "Tour in Sicily and Malta," and he herein describes at some length his ascent of Etna; he also introduces as many facts concerning the mountain as he could collect from the Canon Recupero and others. His account is more complete than any which had appeared in English up to that

time, and he is frequently quoted in every account of the mountain which we have met with.

Ferrara. It was reserved however for the Abate Francesco Ferrara, Professor of Physical Science in the University of Catania, to write the first history of Etna which had any claim to completeness. This entitled *Descrisione dell' Etna, con la Storia delle erurzioni e il Catalogo dei prodotti.* The first edition appeared in 1793, and a second was printed in Palermo in 1818. It is illustrated by a map, and some rather rough engravings. The author was born upon the mountain and his work has evidently been to a great extent a labour of love. It is full of personal observations, while it also embodies the principal results of other observers, and it has furnished the foundation of all that has since been written about Etna.

Captain Smyth During the years 1814—15—16, Captain Smyth, acting under the directon of the Admiralty made a survey of the coast of Sicily and measured the distances of the adjacent islands. This was necessary in consequence of the very defective state of the Mediterranean charts. Although at this time there were observatories at Palermo, Naples, and Malta, the exact position of any one of them was unknown; and some places on the coast of Sicily were mapped as much as twenty miles out of their true position. Smyth carefully determined the latitude and longitude of Etna; accurately measured the height, and examined the surroundings of the mountain. His results were published in 1824, and are often quoted as the most accurate which we possess.

Gemellaro. In 1824 Dr. Joseph Gemellaro, who lived all his life on the mountain, and made it his constant study, published an "Historical and topographical map of the eruptions of Etna from the era of the Sicani to the year 1824." In it he delineates the extent of the three Regions, *Coltivata*, *Selvosa*, and *Deserta*; he places the Minor Cones to the number of 74 in their proper places; and he traces the course of the various lava-streams which have flowed from them and from the great Crater. This map is the result of much patient labour and study, and it is a great improvement upon that of the Abate Ferrara, but of course it is impossible for one man to survey with much accuracy an area of nearly 500 square miles, and to trace the tortuous course of a large number of lava streams. Hence we must be prepared for inaccuracies, and they are not uncommon:—the coast line is altogether wrong as to its

bearings, some of the small towns on the sides of the mountain are misplaced, and but little attention has been paid to scale. Still the map is very useful, as it is the only one which shows the course of the lava-streams.

Von Waltershausen

About the year 1847 Baron Sartorius Von Waltershausen commenced a minute survey of Etna, and a complete description of the mountain both geologically and otherwise. He was assisted by a brother professor and by two Sicilians, and their labours extending over several years, resulted in the production of a fine Atlas of Etna which even in its imcomplete form costs £12. There are 26 maps in folio and 31 engravings. Unfortunately the work has never been completed owing to the death of Von Waltershausen, but even in its present form it furnishes the most exhaustive history of any one mountain on the face of the earth. Dr. Baltzers' "*Wanderungen am Aetna*" in a recent volume of the memoirs of the Swiss Alpine Club, is mainly based on the results obtained by Von Waltershausen.

Lyell.

Sir Charles Lyell visited Etna three times; (in 1824, 1857, and 1858), and he has embodied his researches in a memoir communicated to the Royal Society, and in a lengthy chapter in his "Principles of Geology." His investigations have done much to add to our knowledge of the formation and geological characteristics of the mountain.

Map of the Stato Maggiore

But the most important contribution to the literature of the mountain has been the fine map of the Stato Maggiore constructed by order of the Italian Government between 1864 and 1868. It embraces the whole of Sicily, and is laid down on the unusually large scale of 1 in 50,000, or 1·266 inch to a mile. The portion relating to Etna and its immediate surroundings occupies four sheets. All the small roads, and rivulets are introduced; the Minor Cones and monticules are placed in their proper positions, and the elevation of the ground is given at short intervals of space over the entire map. An examination of this map proves to us that it represents the first accurate survey of the mountain. It shows us that distances and areas, and heights have been repeatedly misstated, the minor cones misplaced, and the trend of the coast line misrepresented. For example, if we draw a line due North and south through Catania, and a second line from the Capo di Taormina, (the north eastern limit of the base of Etna,) until it meets the first line at Catania, the lines will be found to enclose an angle of

26° if we adopt the same plan with Gemellaro's map, the included angle is found to be 53°! and in the case of Ferrara's map 61°!! Again it has been stated on good authority that the lava of 396 B.C. which enters the sea at Capo di Schiso flowed for a distance of nearly 30 miles, the map shows us that its true course was less than 16 miles. Lyell in 1858 gives a section of the mountain "from West 20° N. to East 20° S." But a comparison with the new map proves that the section is really taken from west 35° N. to East 35° S., an error which at a radius of ten miles from the Crater would amount to a difference of nearly 3 miles.

As to any recent account of the mountain, I must say that even in the most reputable books the errors are numerous, and often grotesquely absurd. Any such articles that I have come across (and I have sought for them far and wide) seem to me to have been written by people who have never seen the mountain, and who have extracted a sentence from one book here, and another there, and have not even taken the trouble to see whether the extracts themselves agreed. I think we might fairly write a receipt, after the cookery book fashion, for all the recent accounts of Etna, I have met with. It would be something of this sort:—Take of Brydone's "Tour in Sicily" 3 parts, of Houel "Voyage pittoresque, &c," 1 part, of Ferrara "Descrizione dell'Etna," 6 parts, mix well together, and if they do not incorporate add a little Smyth's "Sicily," season with Daubeny and Scrope on Volcanoes, and serve up with Lyell (Principles of Geology) Sauce: Really this is the proceeding in the long article of nine quarto pages in a standard work of reference. One of the main features of the mountain (the large number of parasitic cones), is very slightly touched upon, and then only by way of quotation from Daubeney; and the astounding statement occurs that the visible horizon is "800 *or* 900 *miles in diameter!!*" In a recent and somewhat standard Gazetteer, the author asserts that the *cone* of Etna is divided into three regions, the *fertile*, the *woody*, and the *desert*, whereas the cone itself is the desert region without a particle of vegetation. The same author gives the area of the three regions as 849 square miles, a number as we shall afterwards see which far exceeds the reality.

Height. The height of Etna has been often determined. The earlier writers had very extravagant notions on the subject, and a height of 3 miles has sometimes been assigned to it. Brydone, Saussure, Shuckburgh, Irvine, and others obtained approxima-

tions to the present height. It must be borne in mind, however, that the cone of a volcano is liable to variations in height at different periods, and a diminution of as much as 300 feet occurred during one of the eruptions of Etna owing to the falling in of the upper portion of the crater. During the last 60 years, however, the height of the mountain has been practically constant. In 1815 Captain Smyth determined the height to be 10874 feet. In 1824 Sir John Herschell, who was unacquainted with Smyth's results, estimated it at 10872½ feet. The new map of the Stato Maggiore gives 3312·61 metres, equal to 10867·94 feet. Prof. Jukes (Manual of Geology) says "If we were to put Snowdon, the highest mountain in Wales, on the top of Ben Nevis, the highest in Scotland, and Carrantuohill, the highest in Ireland, on the summit of both, we should make a mountain but a very little higher than Etna, and we should require to heap up a great number of other mountains round the flanks of our new one in order to build a gentle sloping pile which should equal Etna in bulk."

Radius of Vision.

The radius of vision from the summit of Etna is very variously stated. The exaggerated notions of the earlier writers that the coasts of Africa and of Greece are sometimes visible may be at once set aside. Lord Ormonde's statement that he saw the Gulf of Taranto and the mountains of Terra di Lecce beyond it,—a distance of 245 miles,—must be received with caution. It is, however, a fact that Malta, 130 miles distant, is often visible, and Captain Symth asserts that a considerable portion of the upper part of the mountain may sometimes be seen from Malta. It is stated on good authority that Monte S. Giuliano above Trapani and the Œgadean Isles, 160 miles distant, are sometimes seen. Other writers give 128 miles for the limit. The fact is, that atmospheric refraction, varies so much with different conditions of the atmosphere that it is almost impossible to give any exact statement. The more so when we remember that there may be many layers of atmosphere of different density between the observer and the distant horizon. Distant objects seem to be just under one's feet when seen from the summit of the mountain. Smyth gives the radius of vision as 150·7 *miles*: and this I am inclined to adopt as the nearest approach to the truth, because Smyth was an accurate observer, and he made careful corrections both for error of instruments and for refraction. This radius gives an

horizon 946·4 miles in circumference and an included area of 39,900 square miles,—larger than the area of Ireland. If a circle be traced with the crater of Etna as a centre, and a radius of 150 miles, it will be found to take in the whole of Sicily, and Malta, to cut the western coast of Italy at Scalea in Calabria, leaving it the south east coast near cape Rizzuto. Such a circle will include the whole of Ireland. If we take Derby as the centre, its circumference will touch the sea beyond Yarmouth on the east, the Isle of Wight on the south, the Irish channel on the west, and it will pass beyond Carlisle and New Castle-on-Tyne on the north.

Boundaries of Etna.

The road which surrounds the mountain is carried along its lower slopes, and is 87 miles in length. It passes through the towns of Paterno, Aderno, Bronte, Randazzo, Linguaglossa, Giarre, and Aci Reale. It is considered by some writers to define the base of the mountain, which is hence most erroneously said to have a circumference of 87 miles; but the road frequently passes over high beds of lava, and it winds considerably. It is about 10 miles from the crater on the north, east, and west sides, increasing to 15½ miles at Paterno (S.W.) The elevation on the north and west flanks of the mountain is nearly 2500 feet, while on the south it falls to 1500 feet, and on the east to within 50 feet of the level of the sea. It is quite clear that it cannot be asserted with any degree of accuracy to define the base of the mountain.

The "natural boundaries" of Etna are the rivers Alcantara and Simeto on the north, west, and south; and the sea on the east to the extent of 23 miles of coast, along, which lava streams have been traced, sometimes forming headlands several hundred feet in height. The base of the mountain as defined by these natural boundaries, is said to have a circumference of "at least 120 miles," an examination of the new map, however, proves that this is over-estimated.

If we take the sea as the Eastern boundary, the river Alcantara (immediately beyond which Monte di Mojo the most northerly minor cone of Etna is situated), as the Northern boundary, and the river Simeto as the boundary on the West and South, we obtain a circumference of 91 *miles* for the base of Etna. In this estimate the small sinuosities of the river have been neglected, and the southern circuit, has been completed by drawing a line from near Paterno to Catania,

because the Simeto runs for the last few miles of its course through the plain of Catania, quite beyond the most southerly stream of lava.

Area. The area of the region enclosed by these boundaries is approximately 480 *square miles*. Reclus gives the area of the mountain as 1200 square Kilometres=461 square miles. (*Nouvelle Geographie Universelle* 1875.) The last edition of a standard Gazetteer states that the area of the mountain is "849 square miles;" but this estimate is altogether absurd, for if a circle be drawn with a radius of 16 miles from the crater, it will pass out to sea to a distance of 4½ miles on the east, while on the west and north it passes through limestone and sandstone formations far beyond the Alcantara and the Simeto, and beyond the limit of the lava streams.

Population. There are two cities (Catania and Aci Reale,) and no less than 63 towns or villages on Mount Etna. It is far more thickly populated than any other part of Sicily or Italy, for while the population of Italy per square Kilometre is 90, and of Sicily 88, that of the habitable zone of Etna is 550! No less than 300,000 persons live on the mountain. Thus with an area rather larger than that of Bedfordshire (462 square miles), it has more than double the population; and with an area equal to about one-third that of Wiltshire, the population of the mountain is greater by nearly 50,000 inhabitants. The population of Etna appears to be rapidly increasing: if we compare the number of inhabitants in the three principal towns in 1824, and in 1871, this fact becomes strikingly obvious:—

	1824.	1871.
Catania.....	45081	84000
Aci Reale	14094	24157
Paterno	9808	15300

General aspect of Etna. The general aspect of Etna is that of a pretty regular cone, covered with vegetation, except near the summit. The regularity is broken on the East side by a slightly oval valley, four or five miles in diameter called the *Val del Bove*. This commences about two miles from the summit, and is bounded on three sides by nearly vertical precipices from 3000 to 4000 feet in height. The bottom of the valley is covered with lavas of various date, and several minor craters have from time to time been upraised from it. Many eruptions have commenced in the immediate neighbourhood of the Va del Bove, and Lyel

believes that there formerly existed a centre of permanent eruption in the valley. The Val de Bove is altogether sterile, but the mountain at the same level is on other sides clothed with trees. The vast mass of the mountain is realised by the fact that after twelve miles of the ascent from Catania, the summit looks as far off as it did at starting. Moreover Mount Vesuvius might be almost hidden away in the Val del Bove.

Regions. The surface of the mountain has been divided into three Zones or Regions, the *Piedimontana* or *Coltivata*; the *Selvosa*, or *Nemorosa*; and the *Deserta* or *Discoperta*.

Coltivata. The lowest of these, or *Cultivated Region*, yields in abundance all the ordinary Sicilian products. The soil which consists of decomposed lava is extremely fertile, although of course large tracts of land are covered by recent lavas, or by those which decompose slowly. In this Region the vine flourishes, and abundance of corn, olives, pistachio nuts, oranges, lemons, figs, and other fruit trees. The breadth of this region varies, it terminates at an approximate height of 2000 feet. A circle drawn with a radius of ten miles from the crater roughly defines the limit of this Region. The elevation of this on the north is 2310 feet near Randazzo: on the south 2145 feet near Nicolosi; on the east 600 feet near Masceli; and on the west 1145 feet near Bronte. The breadth of this cultivated zone is about 2 miles on the north, east, and west, and 9 or 10 on the south, if we take for the base of the mountain the limits proposed above.

Selvosa. The *Woody Region* commences where the cultivated Region end, and it extends as a belt of varying width to an approximate height of 6300 feet. This terminated above by a circle having a radius of nearly 1½ miles from the crater. There are fourteen separate forests in this region; some abounding with the oak, beech, pine, and poplar, others with the chesnut, ilex, and cork tree.

Castagno di Cento Cavalli. The celebrated *Castagno di Cento Cavalli* one of the largest and oldest trees in the world is in the forest of Carpinetto on the east side of the mountain five miles above Giarre. This tree has the appearance of five separate trunks united into one, but Ferrara declares that by digging a very short distance below the surface, he found one single stem. The public road now passes through the much decayed trunk. Captain Smyth measured the circumference of the tree a few feet from the ground and

found it to be 163 feet, which would give it a diameter of more than 50 feet. The tree derives its name from the story that one of the Queens of Aragon once took shelter in its trunk with a suite of 100 horsemen. Near this patriarch are several large chesnuts which without a shadow of doubt are single trees ; one of these is 18 feet in diameter, and a second 15 feet, while the *Castagno della Galea*, higher upon the mountain, is 25 feet in diameter, and probably more than 1000 years old. The breadth of the Regione Selvosa varies considerably, in the direction of the Val de Bove it is very narrow, while elsewhere it frequently has a breadth of from 6 to 8 miles.

Regione Deserta.

The Desert Region is embraced between the limit of 6300 feet and the summit. It occupies about 10 square miles, and consists of a dreary waste of black sand, scoriæ, ashes, and masses of ejected lava. In winter it remains permanently covered with snow, and even in the height of summer, snow may be found in certain rifts.

Botanical Regions.

Botanists have divided the surface of Etna into seven regions. The first extends from the level of the sea to 100 feet above it, and in it flourishes the palm, banana, Indian fig or prickly pear, sugar-cane, mimosa, and acacia. This is a somewhat deceptive statement, for it is only on the east side of the mountain that the level within the base sinks to 100 feet above the sea; moreover the palm, banana, and sugar-cane are comparative rarities in this part of Sicily. Prickly pears and vines are the most abundant products of the lower slopes of the eastern side of Etna. The second or hilly region reaches from 100 to 2000 feet above the sea, and therefore constitutes with the preceding, the *Regione Coltivata* of our former division. In it are found cotton, maize, orange, lemon, shaddock, and the ordinary Sicilian produce. The culture of the vine ceases near its upward limit. The third or woody region reaches from 2000 to 4000 feet, and the principal trees within it are the cork, oak, maple, and chesnut. The fourth region extends from 4000 to 6000 feet, and contains the beech, Scotch fir, birch, dock, plaintain, and sandworth. The fifth or sub-alpine region extending from 6000 to 7000 feet, contains the barbery, soapwort, toad-flax, and juniper. In the sixth region, 7500 to 9000 feet are found soapwort, sorrel and groundsel; while the last narrow zone 9000—9200 feet contains a few lichens. The flora of Etna comprises 477 species, only 40 of which are found between 7000 feet and

the summit, while in the last 2000 feet only fine phanerogamous species are found: viz., Anthemis Etnensis; Senecio, Etnensis, Robertsia taraxacoides, (which are peculiar to Etna), tanacetum vulgare, and Astragulus Siculus. Common ferns, such as the pteris aquilina, are found in abundance beneath the trees in the Regione Selvosa.

Minor Cones. A remarkable feature of Etna is the large number of Minor Craters which are scattered over its sides. They look small in comparison with the great mass of the mountain, but in reality some of them are of large dimensions. Monte Minardo, near Bronte, the largest of these Minor Cones is still 750 feet high, although its base has been raised by modern lava streams which have flowed around it. There are 80 of the more conspicuous of these minor cones, but Von Waltershausen has mapped no less than 200, within a ten-mile radius from the great crater, neglecting many monticules of ashes. As to the statement which one meets with in Reclus to the effect that there are 700 Minor Cones, and in Jukes, that the number is 600, it is to be supposed that they include not only the more insignificant monticules, and heaps of cinders, but also the *bocche* and *boccarelle* from which at any time lava or fire has issued. If these be included no doubt these numbers are not exaggerations. The only important minor cone which has been raised during the historical period, is the double mountain known as Monti Rossi from the red colour of the cinders which compose it. This was raised from the plain of Nicolosi during the eruption of 1669; it is 450 feet in height, and 2 miles in circumference at the base. In a line between the Monti Rossi and the great crater, 33 minor cones may be counted, and Captain Smyth was able to discern 50 from an elevated position. Many of these paraisitic cones are covered with vegetation, as the names Monte Faggi, Monte Ilice, Monte Zappini, indicate: The names have not been happily chosen, thus there are several cones in different parts of the mountain, called by the same name:—Monte Arso, Monte Nero, Monte Rosso, Monte Frumento, are the most common of the duplicates. Moreover the names have from time to time been altered, and it thus sometimes becomes difficult to trace a cone which has been alluded to under a former name, or by an author who wrote before the name was changed. In addition to the Minor Cones from which lava once proceeded, there are numerous smaller vents for the subterranean fires called *Boccarelle del*

Fuoco. In the eruption of 1669, thirteen mouths opened in the course of a few days, and in the eruption of 1809, twenty new mouths opened one after the other in a line about six miles long. Two new craters were formed in the Val del Bove in 1852, and seven craters in 1865. The outbursts of lava from lateral cones is no doubt due to the fact that the pressure of lava in the great crater, which is nearly 1000 feet in depth, becomes so great, that the lava is forced out at some lower point of less resistance. The most northerly of the Minor Cones is Monte di Mojo from whence issued the lava of 396 B.C.; it is 11½ miles from the Crater; the most southerly Cone is Monte Ste. Sofia, 16 miles from the crater. Nearly all the minor cones are within ten miles of the crater, and the majority are collected between south, east, and west that is in an angular space of 135° starting midway between east and south, (45° south of due east), to due west, (90° west of due south). Lyell speaks of the minor cones "as the most grand and original feature in the physiognomy of Etna."

Ascent of the Mountain.

The best period for making the ascent is between May and September, after the melting of the winter snows and before the autumnal rains. In winter there is frequently 9 or 10 miles of snow stretching from the summit downwards, the paths are obliterated, and the guides refuse to accompany travellers. Moreover violent storms often rage in the upper regions of the mountain, and the wind acquires a force which it is difficult to withstand, and is at the same time piercingly cold. The writer of this article made the ascent of the mountain two months ago (August, 1877), accompanied by a courier and a guide. The weather was uniformly bright and fine, and there had been no rain for more than three months. The temperature in the shade at Catania, and generally along the eastern boundary of the mountain was a mean of 82° F. We left Catania soon after midday, and drove to Nicolosi 12 miles distant and 2288 feet above the sea. The road for some distance lay through a very fertile district; on either side there were corn-fields and vineyards, and gardens of orange and lemon trees, figs and almonds, growing in the decomposed lava. The road passes through several small villages,—Pasquale, Gravina, and Mascalucia,—the latter a town of 4000 inhabitants. Soon after this the Monti Rossi are seen apparently close at hand, the village of Torre di Grifo is passed, and the road then enters a nearly

barren district, covered with the lava of 1537. The only prominent vegetation is a peculiar tall broom (*Genista Etnensis*) which here flourishes. We reached Nicolosi at half-past 4 o'clock. The temperature was 80° F. Here we dined in the one room of the very primitive inn; starting for the summit at 6 o'clock. For a short distance above Nicolosi stunted vines are seen growing in black cinders, but these soon give place to a large tract covered with lava and ashes, with here and there patches of broom. The mules seemed to know the way perfectly, and they continued to ascend with the same easy even pace without any guidance, even after the sun had disappeared behind the western flank of the mountain. You trust yourself absolutely to the mule, which picks his way over the roughest ground, and rarely stumbles, or changes his even step. We found it quite easy to write notes while ascending, and even to use a pocket-spectroscope at the time of the setting sun. The same confidence must not however be extended to the donkeys of Etna, as we found to our cost. Some days later we happened to be at Taormina, and the only animal we could procure to carry us down to the seashore 800 feet below, was a donkey. It was during the hottest part of the day, and it was necessary to carry an umbrella in one hand, and comfortable to wear a kind of turban of many folds of thin muslin round one's cap. The donkey after carefully selecting the roughest and most precipitous part of the road, promptly fell down, leaving me extended at full length on the road, with the open umbrella a few yards off. At the same time the turban came unfolded, and stretched itself for many a foot upon the ground. Altogether it was a most comical sight, and it reminded me forcibly, and at the instant, of a picture which I once saw over the altar of a church in Pisa, and which represented S. Thomas Aquinas discomforting Plato, Aristotle, and Averrões. The latter was completely overthrown, and in the most literal sense, for he was grovelling in the dust at the feet of S. Thomas, while his disarranged turban had fallen from him.

The district of lava and ashes above Nicolosi is succeeded by forests of small trees, and we are now fairly within the *Regione Selvosa*. At half-past 8 o'clock the temperature was 66° F. About 9 o'clock we arrived at the Casa del Bosco (4216 feet) at the foot of Monte Rinazzi, a small house in which several men in charge of the forest live. Here we rested till 10 o'clock; and then having put on a great coat and double-waistcoat, we started

for the higher regions. The air was extraordinarily still, the flame of a candle placed near the open door of the house did not flicker. The ascent now carried us through forests of pollard oaks, in which it was quite impossible to see either a path, or any obstacles which might lie in ones way. The guide carried a lantern, and the mules seemed well accustomed to the route. At about 6300 feet we entered the *Regione Deserta*, a lifeless waste of black sand, ashes, and lava; the ascent become more steep, and the air was bitterly cold. There was no moon but the stars shone with an extraordinary brilliancy, and sparkled like particles of white hot steel. We had never before seen the heavens studded with such myriads of stars. The Milky Way shone like a path of fire, and meteors flashed across the sky in such numbers that we soon gave up any attempt to count them. The vault of heaven seemed to be much nearer than when seen from the earth, and more flat, as if only a short distance above our heads, and some of the brighter stars appeared to be hanging down from the sky. Brydone in speaking of his impressions says, "The sky was clear, and the immense vault of heaven appeared in awful majesty and splendour. We found ourselves more struck with veneration than below, and at first were at a loss to know the cause; till we observed with astonishment, that the number of the stars seemed to be infinitely increased; and the light of each of them appeared brighter than usual. The whiteness of the Milky Way was like a pure flame that shot across the heavens; and with the naked eye we could observe clusters of stars that were invisible in the regions below. We did not at first attend to the cause, nor recollect that we had now passed through ten or twelve thousand feet of gross vapour, that blunts and confuses every ray before it reaches the surface of the earth. We were amazed at the distinctness of vision, and exclaimed together, "What a glorious situation for an observatory! Had Empedocles had the eyes of Galileo, what discoveries must he not have made! We regretted that Jupiter was not visible, as I am persuaded we might have discovered some of his satellites with the naked eye, or at least with a small glass I had in my pocket."

Appearance of the Sky.

Brydone wrote a hundred years ago, but his idea of erecting an observatory on Mount Etna was only revived last year, when Professor Taochini the Astronomer Royal at Palermo, communicated a paper to the Accademia Gioenico,

Proposed Observatory.

entitled "*Della Convenienza ed utilità di erigere sull'Etna una Stazione Astronomico-Meteorologico.*" Tacchini notices the extraordinary blueness of the sky as seen from Etna, and the appearance of the sun, which is "whiter and more tranquil" than when seen from below; moreover the spectroscopic lines are defined with wonderful distinctness. In the evening at 10 o'clock Sirius appeared to rival Venus, the peculiarities of the ring of Saturn were seen far better than at Palermo, and Venus emitted a light sufficiently powerful to cast shadows, it also scintillated. When the chromosphere of the sun was examined the next morning by the spectroscope the inversion of the magnesium line, and of the line 1474 was immediately apparent, although it was impossible to attain this effect at Palermo. Tacchini proposes that an Observatory should be established at the Casa Inglesi in connection with the University of Catania, and that it be provided with a good six-inch refracting telescope, and with meteorological instruments. In this observatory constant observations should be made from the beginning of June to the end of September, and the telescope should then be transported to Catania, where a duplicate mounting might be provided for it, and observations continued for the rest of the year. There seems to be every probability that this scheme will be carried out in the course of next year.

Ascent resumed.

During this digression we have been toiling along the slopes of the *Regione Deserta* and looking at the sky; at length we reach the *Piano del Lago* or Plain of the Lake, so called because a lake, produced by the meeting of the snows, existed here till 1607 when it was filled up by lava. The air is now excessively cold, and a sharp wind is blowing. Progress is very slow, the soil consists of loose ashes, and the mules frequently stop. The guide assures us that the Casa Inglesi is quite near, but the stoppages become so frequent that it seems a long way off; at length we dismount, and drag the mules after us, and after a toilsome walk the small lava-built house called the Casa Inglesi is reached, (1.30 a.m., Temperature 40 F.). It stands at a height of 9652 feet above the sea, near the base of the cone of the great crater. The Casa Inglesi takes its name from the fact that it was erected by the English officers stationed in Sicily in 1811. It has suffered severely from time to time from the pressure of snow and from earthquakes, but it was thoroughly repaired in 1862 on the occasion of the visit of Prince Humbert,

Casa Inglesi.

and is now in tolerable preservation. It consists of three rooms containing a few deal chairs, a table, and several shelves like the berths of ships furnished with plain straw mattresses. There is also a rough fireplace. When we reached the house, very weary and so cold that we could scarcely move, it was discovered that the courier had omitted to get the key from Nicolosi, and there seemed a prospect of spending the hours till dawn in the open air. Fortunately we had with us a hard chisel and a geological hammer, and by the aid of these we forced open the shutter, serving as a window, and crept into the house. Ten minutes later a large fire of wood was blazing up the chimney, our eatables were unpacked, some hot coffee was made, and we were supremely comfortable. At 3 a.m. we left the Casa Inglesi for the summit of the great crater, 1200 feet above us, in order to be in time to witness the sunrise. Our road lay for a short distance over the upper portion of the Piano del Lago, and the walking was very difficult. The brighter stars had disappeared, and it was much darker than it had been some hours before. The guide led the way with a lantern. The ascent of the cone was a very stiff piece of work; it consists of loose ashes and blocks of lava, and slopes at an angle of "45° or more" according to one writer, and of 33° according to another. Probably the slope varies on different sides of the cone; we should certainly incline to the 45° on the side of the cone which we ascended. Fortunately there was no strong wind, and we did not suffer from the sickness of which travellers constantly complain, in the rarefied atmosphere of the summit. We reached the highest point at 4.30 p m., and found a temperature of 47°F. Steam and sulphurous acid issued from the ground, under our feet, and the cinders were so hot in some places that it was necessary to choose a cool place to sit down on. A thermometer inserted just beneath the soil from which steam issued, registered 182°F. We now anxiously awaited the rising of the sun. Nearly all the stars had faded away. The vault of heaven was a pale blue, becoming a darker and darker grey towards the west, where it appeared to be nearly black. Just before sunrise the sky had the appearance of an enormous arched spectrum extremely extended at the blue end. Above the place where the sun would presently appear there was a brilliant red, shading off in the direction of the zenith, to orange, and yellow; this was succeeded by pale green; then a long stretch of pale blue, darker blue, and dark grey, ending opposite

Summit of the great Crater.

Sunrise from the summit.

the rising sun with black. This effect was quite distinct; it lasted some minutes, and was very remarkable. This was succeeded by the usual rayed appearance of the rising sun, and at ten minutes to 5 o'clock the upper limb of the sun was seen above the mountains of Calabria. Examined by the spectroscope the Fraunenhofer lines were extremely distinct, particularly two lines near the red end of the spectrum.

View from the summit.

The top of the mountain was now illuminated, while all below was in comparative darkness, and a light mist floated over the lower regions. We were so fortunate as to witness a phenomenon which is not always visible, viz, the projection of the triangular shadow of the mountain across the island, a hundred miles away. The shadow appeared vertically suspended in space at or beyond Palermo, and resting on a slightly misty atmosphere; it gradually sank until it reached the surface of the island, and as the sun rose, it approached nearer and nearer to the base of the mountain. In a short time the flood of light destroys the first effects of light and shadow. The mountains of Calabria and the west coast of Italy appeared very close, and Stromboli and the Lipari Islands almost under our feet; the east coast of Sicily could be traced until it ended at Cape Passaro and turned to the west forming the southern boundary of the island, while to the west distant mountains appeared. No one would have the hardihood to attempt to describe the various impressions which rapidly float through the mind during the contemplation of sunrise from the summit of Etna. Brydone, who is by no means inclined to be rapturous or ecstatic in regard to the many wonderful sights he saw in the course of his tour, calls this "the most wonderful and most sublime sight in nature." "Here," he adds, "description must ever fall short; for no imagination has dared to form an idea of so glorious and so magnificent a scene. Neither is there on the surface of this globe, any one point that unites so many awful and sublime objects. The immense elevation from the surface of the earth, drawn as it were to a single point, without any neighbouring mountain for the senses and imagination to rest upon, and recover from their astonishment in their way down to the world. This point or pinnacle, raised on the brink of a bottomless gulph, as old as the world, often discharging rivers of fire, and throwing out burning rocks, with a noise that shakes the whole island. Add to this, the unbounded extent of the prospect, comprehending the greatest diversity and the

most beautiful scenery in nature, with the rising sun, advancing in the east to illuminate the scene."

The Crater. When the sun had risen we had time to examine the crater, a vast abyss nearly 1000 feet in depth, and with very precipitous sides. Its dimensions vary, but it is now between two and three miles in circumference. Sometimes it is nearly full of lava, at other times it appears to be bottomless. At the present time it is like an inverted cone; its sides are covered with incrustations or sulphur and ammonia salts, and jets of steam perpetually issue from crevices. Near the summit we found a deposit several inches in thickness of a white substance, apparently a silicate, deposited by the hot issuing gases. Hydrochloric acid is said to frequently issue from the crater; the gases that were most abundant appeared to be sulphurous acid and steam. The interior of the crater appeared to be very similar to that of the Solfatara near Pozzuoli. During the descent from the cone we collected various specimens of ash and cinder, some red, others black and very vesicular, others crystalline, some pale pink. The steep slope of the cone was well shown by the fact that although the surface is either extremely rugged owing to the accumulation of masses of lava, or soft and yielding on account of the depth of cinders, a large mass of lava sent rolling at the top rushes down with increasing velocity until it bounds off to the level plain below.

At the Casa Inglese we remounted the mules, and made a slight detour to the east in order to look down into the Val del Bove, which is here seen as a gigantic valley bounded on the north by the precipitous cliffs of the Serra delle Concazze, and on the south by the Serra del Solfizio. It is believed by Lyell and others that in the Balzo di Trifoglietto at which point the precipices are most profound and abrupt, there was a second permanent crater of eruption. The Torre del Filosofo, a ruined tower, traditionally the observatory of Empedocles, stands near the Casa Inglesi. Not far from this a great deposit of ice was found in 1828. It was preserved from melting by a layer of ashes and sand which had covered it soon after its first existence as a glacier, a stream of lava subsequently flowed over the ashes, and completely protected the ice; the non-conducting power of the ashes prevented the lava from melting the ice. The snow which falls on the mountain is stored away in caves and used by the Sicilians during summer. A ship-load is also sent to Malta, and the Archbishop of Catania derives a good deal of his income from the sale of Etna snow.

Effects of Refraction.

During our descent from the mountain we were much struck by the apparent nearness of the minor cones beneath us, and of the villages at the base of the mountain. They seemed to be painted on a vertical wall in front of us, and although from ten to fifteen miles distant they appeared almost within a stone's throw. This curious effect, which has often been observed before, is due to refraction. At the summit of Etna we have left one-third of the atmosphere beneath us, and the air is now pressing upon us with a weight of ten pounds on the square inch instead of the usual fifteen pounds experienced at the level of the sea. In looking towards the base of the mountain we are consequently looking from a rarer to a denser medium, and it is a law of optics that when light passes from a denser to a rarer medium it is refracted away from the perpendicular, and thus the object from which it emanates appears raised, and nearer to us than it really is. The objects around Etna appear near to us, and raised vertically from the horizon for the same reason that a stick plunged in water appears bent.

Fatigue of the Ascent.

We reached Nicolosi again about noon having left it eighteen hours before. The ascent of the mountain, although it does not involve much hard walking, is somewhat trying on account of the extremes of temperature which are experienced. In the course of the morning of our descent we had experienced a difference equal to more than 40°F. As to the ascent: you are moving upwards nearly all night: you have six hours of riding on a mule, some of it in a bitterly cold atmosphere: you get very much heated by the final steep climb of 1100 feet, and you find at the summit a piercing wind; of course there is no shelter, and you sit down to wait for sunrise on cinders which are gently giving off steam and sulphurous acid; the former condenses to water as soon as it meets the cold air, and you find your great coat, or the rug on which you have sat down, speedily saturated with moisture.

After resting for awhile at Nicolosi, we started to make a *giro* of the mountain, by way of the base road before mentioned, which passes through Paterno, Aderno, Bronte, Randazzo, Giarre, and Aci Reale.* Descending into the Regione Coltivata we passed through Paternò the largest town on the flanks of Etna, after Catania and Aci Reale. It stands on the site of the Sikelian town of Hybla Major. The present town was founded

Paterno.

* See the map which is by Kieppert, and is taken from Baedeker.

by King Roger 1st, in 1073. It now contains 15,300 inhabitants. Following the road to the north east we pass through the village of Ste. Maria di Licodia on the site of the ancient Aitna, then Biancavilla with 9328 inhabitants, and late in the evening we reach Adernò, a town of 13000 inhabitants. It was founded by Roger 1st in the 12th century on the site of the Sikelian City of Adranum, which contained the great temple of Zeus Adranos guarded by 1000 dogs. The reception which awaited us at Aderno after our climb of the previous night, and a very fatiguing day was somewhat unexpected. We were directed to an inn, kept by a doctor whose brother had been the Sindaco of the town. Here we found a horrible old Sicilian woman who showed us with great incivility the only room in the house which we could have. It was an extremely filthy place which had not been swept for weeks, and which had never been garnished. It contained three beds, consisting of deal boards placed on iron tressels, a plain deal table, and some primitive chairs. As to food, we asked them if they had bread, "no;" meat, "no;" wine, "no;" could they get us some eggs? "*impossibile:*" neither had they fruit, macaroni, nor butter. Even when we procured some eggs, there were no teaspoons to eat them with. The people of the town seemed to subsist chiefly on beans, and a kind of dried fish. If the courier had not been a very handy fellow and a good cook, we should have been obliged to go to bed supperless. As it was he managed to get some bread, eggs, and wine, and best of all some snow, for the heat was intolerable. In the morning we could not get so much as a cup of coffee in the inn, and we were very glad to make our way to Bronte.

Aderno.

Sicilian Inns.

Between Adernò and Bronte we passed many lava streams, notably those of 1610, 1603, and 1651. The town of Bronte (12,029 inhabitants) stands on the western flanks of Etna at an elevation of 2782 feet. From it Lord Nelson took his title of Duke of Bronte,—an appropriate name for a great warrior (*βροντή*.) The Nelson estates near Bronte are now owned by Lord Bridport who spends a portion of each year in the town, and at a country house in the neighbourhood. The town is extremely primitive, and in several respects reminded me of Pompeii. At the side of one of the principal streets there was an open air kitchen, much resorted to by the people. Here and there awnings were hung across the streets to afford shade. The inn was even worse than that

at Adernò; we were offered one miserable room without a table or chairs. We determined to push on at once to Randazzo. With great difficulty the courier obtained some eggs and macaroni and some fruit, on which we dined in a barn attached to a wine-shop. At Bronte we are 9 miles from the crater, on the steepest side of Etna, and near the Tertiary sandstone which underlies this portion of the mountain. A short distance outside the town we saw great beds of the lava of 1832, piled up fantastically in all sorts of forms, and excessively rugged. It is quite bare of vegetation, and does not appear to have even commenced to be decomposed.

On leaving Bronte our road led us past several high hills of sandstone and quartzite, near Monte Rivoglia, then we passed near the town of Maletto, and after leaving the poisonous lake Gurrita in the valley to our left, we arrived at Randazzo. Before reaching the town, the road attains its culminating point,—

Randazzo. 3852 feet,—nearly opposite Maletto. Randazzo is a town of 7136 inhabitants, it was founded by the Lombards, and the Emperior Frederick II. brought it into notice by giving the title of Duke of Randazzo to one of his sons. It contains some interesting mediœval remains. We were compelled to pass the night in the town, in a inn scarcely superior to that of Adernò, but distinctly better than the miserable Albergo Collegio at Bronte. At least the people were civil, and did their best. The one room of the inn, had a bed in each corner, and a deal table in the middle. Three of the beds were occupied by engineers who were surveying in connection with a new line of railway, the fourth was made over to the courier. I slept in a small kind of ante-room on a bed chiefly composed of deal boards placed on tressels. Here again the courier was invaluable, in fact it would be simply impossible to make the circuit of Etna, without a courier. He procured some eggs, macaroni, fruit, snow, tomatoes, and even meat, and cooked everything well, without a trace of garlic. He also took care that the linen was clean, and the general arrangements as comfortable as they could be under the circumstances. Let us also admit that neither at Adernò, Bronte nor Randazzo were we troubled with musquitoes, or any worse species of insect. These we were assured would appear in full force in the following month. (September). Our only inconvenience of this nature arose from swarms of flies. The inns of these out-of-the-way towns probably receive scarcely a dozen travellers in the year, and

these are Sicilians who are not used to better accommodation. Evidently a *forestiare* is quite a novelty; the people of these small towns used to eye us with great curiosity and crowded round the carriage when we started. At Bronte we had a good example of this curiosity, owing to the hardness of the lava of 1832 the head had come off the handle of our hammer, and we went into a carpenter's shop to have it put on again. Presently we noticed that eleven people, including a priest, were looking on apparently with intense and absorbing interest.

From Randazzo, which is on the northern flanks of Etna 2718 feet above the sea, the base-road descends, until at Giarre it is near the sea-level. This road is one of the most beautiful in Sicily; it is part of the old military road from Messina to Palermo, and it was traversed by Himilco in 396 B.C., by Timoleon in 344 B.C., and by Charles Vth in 1534. Soon after leaving Randazzo the valley of the Alcantara becomes visible, while, on the left rise the mountains of the Nebrodes. The road passes near Monte Dolce, and soon reaches Linguaglossa, a small town from whence the craters of 1865 may be reached in about four hours. The rapidly descending road passes through Piedemonte and Mascali, in the heart of an extraordinarily fertile region. A full view of the coast line is obtained, from the Capo di Taormina on the north, to a point below Riposto on the south. The descent is made through plantations of nuts, and groves of oranges and lemons, to gentle slopes
Giarre. covered with vineyards. From the small town of Giarre we get a view of the Val del Bove, which, however, is almost obscured by thin white clouds while the summit of the mountain is clear. We noticed every day that the summit of the mountain, which had been absolutely clear all the day and night, became covered with clouds shortly before sunset, while about an hour after sunset the clouds cleared off, and the summit was sharply defined against the sky, during the starlit night. Some of the effects of sunset behind the clouds resting on the summit of the mountain while all the rest of the sky was bright blue, were exceedingly beautiful, and were quite untranslatable into any known language, save that of painting and of music. Perhaps Turner could have done justice to them.

After leaving Giarre we pass through a good deal of highly cultivated land belonging to Baron Pennisi, the largest land-holder and richest man in Sicily. He makes good use of his wealth, and seems to be very popular among all classes. He

possesses three palaces in Aci Reale, and has done a great deal to beautify the town. Archæologists will remember him as the possessor of the finest collection of Sicilian coins in the world. Many of these have been found on his own estates, but he never scruples to give large sums of money for any coin which he covets. Aci Reale is one of the prettiest towns in Europe; it is situated in the midst of a very fertile region 550 feet above the sea. To the east it faces the Ionian sea, while on the west towers Etna. The town is full of wealthy inhabitants, and the houses are large, lofty and well-built. It contains 24151 inhabitants, and possesses celebrated sulphur baths, and one of the best hotels in Sicily. The wealth of this small town is well shown by the following fact. Since its foundation in the tenth century, till within a year or two of the present time, the town had belonged to the Bishopric of Catania. It happened, however, a few years ago on the occasion of a religious procession in Catania that the people of Aci considered that the patron saint—S. Venera—was slighted. In fact the image of S. Agata, the patron saint of the Catanese, whose veil has so often averted the lava streams from the city, was put in all the prominent parts of the procession, while the image of S. Venera was comparatively neglected. The people of Aci at once returned home, and sent a petition to the Pope, praying that they might have a Bishop of their own, directly subject to the Holy See, in order that they might no longer have to carry the image of their beloved saint, behind that of S. Agata in the processions of the Archbishop of Catania. The Vatican having duly considered the question consented to raise Aci to the dignity of a Bishopric, and to pay the Bishop a yearly stipend of 10000 lire (about £400, but equal to £600 in that country), on condition that 200,000 lire were paid at once into the coffers of the Vatican. (Apropos in yesterday's *Times* we read "The Vatican now possesses 30,000,000 of lire of capital.") This was promptly done, and now Monsignore Gerlando Genuardi, Bishop of Aci Reale, may snap his fingers in the face of Monsignore Giuseppe Benedetto Dusmet, a Benedictine of the congregation of Monte Cassino, and Archbishop of Catania.

Aci Reale.

Six villages in the neighbourhood of Aci Reale bear the name of Aci,—Aci Castello, Aci Sant, Antonio, and so on, but Aci Reale claims to stand upon the very site rendered memorable by the story of Acis and Galatea. The river Acis (now called *Acque Grande*) rises from a bed of lava, and falls into the

sea a mile from its source. Aci Reale stands on seven different beds of superposed lava, having layers of earth resulting from decomposed lava between. The Canon Recupero calculated from observation, that a lava required at least 2000 years to form even a scanty layer of earth, consequently he inferred that the lowest of the lava streams upon which Aci rests must have been formed 14000 years ago. These views he stated to Brydone, a hundred years ago:—the latter says "Recupero tells me he is exceedingly embarrassed by these discoveries in writing the history of the mountain. That Moses hangs like a dead weight upon him, and blunts all his zeal for enquiry; for that really he has not the conscience to make his mountain so young as that prophet makes the world.—What do you think of these sentiments from a Roman Catholic divine?—the Bishop who is strenuously orthodox,—for it is an excellent See, has already warned him to be upon his guard, and not to pretend to be a better natural historian than Moses; nor to presume to urge anything that may in the smallest degree be deemed contradictory to his sacred authority." The poor Canon Recupero lost his church preferment on the publication of Brydone's book, and the whole body of clergy of Girgenti received a reprimand on account of a capital story which Brydone told of a dinner at which the Bishop presided, during which several of the reverend canons suffered severely from the effects of English punch which Brydone had brewed for them. We quite agree with Admiral Smyth when he says "It is a pity that Mr. Brydone laboured under such a cacoethes, as to sacrifice a friend for the sake of a good story." Of course we now know that Recupero's estimate of the age of Etna was far within the true limits, but we derive this information from other sources, no true estimate can be obtained from the observation of the decomposition of lavas, for it has been often observed that two lavas will decompose at very different rates.

Age of Etna.

A little to the north of the village of La Scaletta, at the base of the rocks upon which Aci Reale stands, there are two small caverns in the abrupt face of the basalt. They can only be approached in a boat, and they consist of columnar Basalt bent very curiously, above the columns amorphous Basalt is seen.

A drive of a few miles to the south of Aci Reale, brings us to Trezza, a small village built of lava. A short distance from the shore are the celebrated *Scogli de' Ciclopi*, or rocks of

Scogli de' Ciclopi.

the Cyclops, said to be those which Polyphemus hurled at Ulysses, after his escape from the cave. The rocks, eleven in number, form small islets th largest of which, the Isola d'Aci, is about 3000 feet in circumference, and 150 feet high. It consists of crudely columnar Basalt capped by a kind of marl. Near the top of the island there is a cave called the "Grotto of Polyphemus," also a cistern of water. To the south of this island a very picturesque rock rises from the sea. It is 2000 feet in circumference and about 200 feet in height, and it consists of columnar Basalt in four and eight-sided prisms, but not very regular; in their interstices a hard calcareous substance is found. Fine crystals of Analcime are sometimes met with in the basalts of the Cyclops Islands. Lyell considers these basalts "the most ancient monuments of volcanic action within the region of Etna."

Nature of the lavas of Etna.

We collected lava from various points around and upon the mountain. They present a wonderful similarity of structure, and a mineralogist remarked that they might all have come from the same crater at the same time. They consist mainly of olivine, magnetic oxide of iron, and feldspar. Sometimes the crystals of the latter are much larger than at others; sometimes olivine prevails, sometimes feldspar. A specimen of lava of 1535 found near Borello, was ground till it was sufficiently transparent to be examined under the microscope with polarized light; it was found to contain good crystals of augite and olivine, well-striated labradorite, and magnetite.

A specimen of Augite from Etna was found to contain:—

Silica	47·68
Lime	20·87
Magnesia	12·90
Alumina	6·74
Protoxide of Iron	11·37
„ Manganese	0·21
Water	0·28
	100·03

Magnetite is

$Fe_2 O_3$	=68
FeO	=31
	100

Olivine is Silicate of Magnesia, and Protoxide of Iron. Labradorite or lime feldspar is Silicate of alumina, lime, and soda. $Al_2 O_3$, 2 SiO_2 + RO. SiO_2.

Eruptions of Etna.

A list of all the eruptions of Etna from the earliest times has been given by several writers, notably by Ferrara in his *Descrizione dell, Etna*, and by Gemellaro. The latter places the first eruption in B.C., 1226, in the time of the Sicani; the second in 1170, B.C., and of the third he says "In 1149, B.C. there was an eruption, and Hercules in consequence fled from the island." Of course these dates are worthless, and the statements are no doubt based upon the assertion of Diodorus that before the Trojan War the Sicani were driven from the east side of Sicily by the eruptions of the volcano.

Seventh century B.C.?

1. The first eruption which really falls within the limit of the historical period is mentioned by Thucydides, it probably happened in the seventh century, B.C.

535, B.C.

2. The second eruption occurred in the time of Pythagoras.

477, B.C.

3. The third eruption occurred in 477 B.C. It is mentioned by Thucydides, and it must be the eruption to which Pindar and Œschylus allude. The former visited the Court of Hiero I, of Syracuse, in 473, B.C., and the latter was in Sicily in 471, B.C. On the occasion of this eruption two heroic youths named Anăpias and Amphĭnomus performed a deed to which Seneca and other writers allude with enthusiasm. While the lava was rapidly overwhelming the city of Katana, they placed their aged parents on their shoulders, and at the risk of their lives bore them through the flaming streets, and succeeded in placing them in safety. It was said that the fiery stream of lava parted to make way for them. Statues were raised to the honour of the *Pii Fratres*, and their burial place was long known as the *Campus Piorum*. Even a temple was erected to commemorate the deed.

426, B.C.

4. The fourth eruption occurred in the year 426, B.C. It is mentioned by Thucydides as having commenced in the sixth year of the Peloponnesian War. It destroyed a portion of the territory of the inhabitants of Katana.

396, B.C.

5. An important eruption occurred in the year 396, B.C. It broke out from Monte di Mojo the most northerly of the minor cones of Etna, and following the course of the river Alcantara (then called the Acesines) entered the sea at the site of the ancient Greek colony of Naxos. Himilco the Carthaginian General was at this time on his way from Messana to Syracuse,

and he was compelled to march his troops round the west side of the mountain in order to avoid the stream of lava.

140, B.C. 6. We hear of no further eruption for 256 years, when in the year 140, B.C., in the consulship of C. Lœlius Sapiens, and Q. Servilius Cœpio there was an outburst from the Volcano, which destroyed 40 people.

134, B.C. 7. Six years later an eruption occurred according to Orosius and Julius Obsequens, in the consulship of Sergius Fulvius Flaccus, and Quintus Calpurnius Piso. We have no details concerning its natu re, or extent.

126, B.C. 8. The same authorities state that in the year 126, B.C., in the consulship of L. Æmilius Lepidus, and L. Aurelius Orestes, Sicily suffered from a very severe earthquake, and a deluge of fiery matter poured from Etna, overwhelming large tracts of country, and rendering the waters of the adjacent Ionian sea positively hot. It is said that the sea near the island of Lipari, boiled, and that the inhabitants ate so large a number of the fishes which were cast, already cooked, upon their shores that a distemper appeared, which destroyed a large number of people.

122, B.C. 9. Four years later Katana was nearly destroyed by a new eruption. The roofs of many of the houses were broken in by the weight of hot ashes which fell upon them ; but the lava stream turned aside near the city and flowed into the sea. The lava is believed to have issued from a small crater near Gravina about 2½ miles from Katana. The city was so much injured by this eruption that the Romans granted the inhabitants an immunity from all taxes for a space of ten years.

49, B.C. 10. An eruption of which we have no details occurred during the Civil War between Cæsar and Pompey.

43, B.C. 11. Livy speaks of an eruption and earthquake which took place shortly before the death of Cæsar, which it was believed to portend.

38, B.C. 12. In 38, B.C. during the Civil War between Octavianus and Sextus Pompeius a violent eruption occurred on the east side of the mountain, accompanied by fearful noises, and outbursts of flame.

33, B.C. 13. Six years afterwards an eruption of a less violent character took place.

40, B.C. 14. The next eruption of which we hear is that mentioned by Suetonius in his Life of Caligula. The Emperor happened to be at Messina at the time, and he fled from the town through fear of the eruption. This was in 40, A.D.

72, A.D. 15. An eruption is stated to have occurred in 72, in the second year after the capture of Jerusalem by Titus.

253, A.D. 16. Etna was now quiescent for nearly two centuries, but in the year 253, in the reign of the Emperor Decius, a violent eruption lasting nine days, occurred. The lava flowed in the direction of Catania, and the inhabitants for the first time tested the efficacy of the veil of S. Agata, which afterwards stood them in such good stead on more than one occasion. The Saint had been martyred the year before, and when the frightened inhabitants saw the stream of lava approaching the city, they rushed to the tomb, and removed the veil which covered the body of the saint. This was carried to the edge of the descending torrent of lava, and at once arrested its progress.

420, A.D. 17. According to Carrera, and Photius an eruption occurred in the year 420.

812, A.D. 18. We now find no record of an eruption for nearly four hundred years. Geoffrey of Viterbo states that an eruption occurred in 812, when Charlemagne was in Messina.

1169, A.D. 19. After another long interval of more than three centuries and a half, the mountain again entered into eruption. In February, 1169, occurred one of the most disastrous eruptions on record. A violent earthquake, which was felt as far as Reggio occurred about dawn, and in a few minutes Catania was a heap of ruins. It is estimated that 15000 persons were buried beneath the ruins. It was the vigil of the feast of St. Agata, and the cathedral of Catania was crowded with people; they were all buried beneath the ruins together with the Bishop and forty-four Benedictine Monks. That side of the cone of the great crater towards Taormina, fell into the crater. At Messina the sea retired to some distance from the shore, and then suddenly returned, overwhelming a portion of the city, and sweeping away a number of persons who had fled to the shore for safety. The clear and pure fountain of Arethusa at Syracuse became muddy and brackish; while the fountain of Ajo near the village of Saraceni, ceased to flow for two hours, and then emitted water of the colour of blood. Ludovico Aurelio states that the vines, corn, and trees, were burnt up over large districts.

1181, A.D. 20. According to Niccolà Speziale, there was a great eruption from the eastern side of the mountain in 1181.

1285, A.D. 21. A stream of lava is said to have burst from the eastern side of the mountain in 1285, when Charles of Anjou, was on his deathbed, and to have flowed fifteen miles.

1329, A.D. 22. In 1329 Niccola Speciale was in Catania, and witnessed the eruption of which he has left us an account. On the evening of June 28th, about the hour of vespers, Etna was strongly convulsed, terrible noises were emitted, and flames issued from the south side of the mountain. A new crater,—Monte Lepre,—opened in the Val del Bove above the rock of Musarra, and emitted large quantities of dense black smoke. Soon afterwards a torrent of lava poured from the crater, and red-hot masses of rock were projected into the air. These effects continued till the 15th of July, when a second crater opened ten miles to the S.E. of Monte Lepre, and near the Church of S. Giovanni Paparometto. Soon after four other craters opened around it, and emitted smoke and lava. The sun was obscured from morning till evening by the smoke and ashes, and the adjacent fields were burnt up by the hot sand and ashes. Multitudes of birds and animals perished and many persons are said to have died from terror. The lava streams were divided into three portions, two of which flowed towards Aci, and the third towards Catania. The ashes were carried as far as Malta, a distance of 180 miles.

1333. 23. Four years afterwards an eruption is recorded by Silvaggio.

1371. 24. A manuscript preserved in the Archives of the Cathedral of Catania, mentions an eruption which occurred on the 6th of August, 1371, which caused the destruction of numerous olive groves near the city.

1408. 25. An eruption which lasted for twelve days, commenced on the 9th of November, 1408; it originated from the great crater, but several mouths subsequently opened near the base of the mountain. Large quantities of red hot ashes were emitted, some of which fell in Calabria. The villages of Pedara and Tre Castagne suffered severely from this eruption.

1444. 26. A violent earthquake in 1444, caused the upper cone of the mountain to fall into the crater. A torrent of lava also issued from the mountain, and moved for a space of twenty days towards Catania, but it did not reach the city.

1446. 27. Two years later lava issued from the Val del Bove near the Rock of Musarra; the crater then formed was perhaps the present Monte Finocchio.

1447. 28. A short eruption of which we have no details occurred in 1447. After which Etna was quiescent for 89 years. In 1533 Filoteo, of whom we have before spoken as one of the earliest historians of Etna, descended into the crater, which possessed

its present funnel-like form. He found at the bottom a hole not larger than a man's head, from which issued a thin moist sulphurous vapour.

Close of the 15th Century.

29. Bembo and Fazzello mention an eruption which occurred towards the close of the 15th century, during which a current of lava flowed from the great crater, and destroyed a portion of Catania.

1536.

30. In March, 1536, a quantity of lava issued from the great crater, and several new apertures opened near the summit of the mountain and emitted lava. It divided into several streams flowing in different directions, one towards Randazzo, a second towards Adernò, and a third towards Bronte. The lava swept everything before it; at the same time quantities of smoke and ashes were ejected, the mountain was convulsed, and fearful noises were heard. Three new craters were formed on the south and west sides of the mountain, and on the 26th March twelve new craters or *bocche* opened between Monte Manfre and Monte Vituri. A physician of Lentini, named Negro di Piazza, having approached too near to the scene of the eruption, was destroyed by a volley of red hot stones. Several rifts were formed in the sides of the mountain from which issued flames and hot cinders.

1537.

31. A year later, in May 1537, a fresh outburst occurred; a number of new mouths were opened on the south slope of the mountain near La Fontanelle, and a quantity of lava was emitted, which flowed in the direction of Catania, destroying a part of Nicolosi, and S. Antonio. In four days the lava had run fifteen miles. At the same time violent shocks of earthquake occurred all over Sicily, the inhabitants thought that the last day had come, and many prepared for their end by receiving extreme unction. According to Filoteo the noises were so violent that many persons were struck deaf. The sun was obscured by smoke and dust, ashes fell in sufficient quantities to destroy the olive plantations of Messina, and were even carried 300 miles out to sea. The great crater suddenly fell in, so as to become level with the Piano del Lago. The height of the mountain was thus diminished by 320 feet.

1566.

32. Three new craters opened in November, 1566, on the north east slope of the mountain Quantities of lava were emitted, which flowed towards Linguaglossa and Randazzo.

1579.

33, A slight eruption of which we have no details occurred in 1579.

1603. 34. According to Carrera an eruption occurred in June, 1603. The mountain was shaken with earthquakes, and great volumes of smoke and of flame were emitted.

1607. 35. A stream of lava issued from the great crater fours years later, and filled up the lake which had previously existed in the Piano del Lago.

1610. 36. In February, 1610, lava was emitted from the great crater. It flowed towards Adernò, and filled up the bed of the Simeto, a little above the Ponte di Carcaci. A few months later a second stream destroyed a large portion of the forest Del Pino.

1614. 37. In 1614 several new craters were opened between Randazzo and the great crater on the north side of the mountain. A quantity of lava issued from them, which united into one stream, and ran for ten miles destroying a great deal of wooded country.

1619. 38. A slight eruption occurred in 1619.

1633. 39. In February, 1633, Nicolosi was partially destroyed by a violent earthquake, and in the following December earthquakes became frequent on the mountain. A new crater opened above the cone called Serrapizzuta, five miles from the great crater, and emitted a good deal of lava. A second crater afterwards opened about two miles to the east of the former. The eruption lasted off and on for four years: the ejected lava then covered a track 18 miles in length by two in width, the thickness sometimes attaining 42 feet. In 1643 a severe earthquake occurred which was manily felt on the west side of the mountain.

1646. 40. In 1646 a new mouth opened on the north-north-east side of the mountain, five miles from the great crater. The lava flowed towards Castiglione.

1651. 41. In February, 1651, several new mouths opened on the west side of the mountain, and poured out vast volumes of lava which threatened to overwhelm Bronte In twenty-four hours the lava ran 16 miles with a breadth of 4 miles.

1669. 42. We have a more detailed account of the eruption of 1669, than of any previous eruption. It was observed by many men of different nations, and we find accounts of it in our own *Philosophical Transactions*, in French, and of course several accounts in Italian. Perhaps the most accurate and complete description of the eruption is that given by Alfonso Borelli, Professor of Mathematics in Catania. The eruption was in every respect one of the most terrible on record. On the 8th of March the sun was obscured, and a whirlwind blew over the face of

the mountain; at the same time earthquakes commenced, and continued to increase in violence for three days, when Nicolosi was converted into a heap of ruins. On the morning of the 11th a fissure nearly 12 miles in length opened in the side of the mountain, and extended from the Piano di S. Leo to Monte Frumento, a mile from the summit, The fissure was only six feet wide, but it seemed to be of unknown depth, and a bright light proceeded from it. Six mouths opened in a line with the principal fissure; they emitted vast columns of smoke, accompanied by loud bellowings which could be heard 40 miles off. Towards the close of the day a crater opened, about a mile below the others, and it ejected red hot stones to a considerable distance, and afterwards sand and ashes which covered the country for a distance of 60 miles. The new crater soon vomited forth a torrent of lava which presented a front of two miles; it encircled Monpilieri, and afterwares flowed towards Belpasso, a town of 8000 inhabitants, which was speedily destroyed. Seven mouths of fire opened around the new crater, and in three days united with it forming one large crater 800 feet in diameter. The torrent of lava all this time continued to descend, and it destroyed the town of Mascalucia on the 23rd of March. On the same day the crater cast up great quantities of sand, ashes, and scoriæ, and formed above itself the great double-coned hill now called Monti Rossi from the red colour of the ashes of which it is mainly composed. On the 25th very violent earthquakes occurred, and the cone of the great central crater was shaken down into the crater, for the fifth time since the first century A.D. The original current of lava had divided into three streams, one of which destroyed S. Pietro, the second Camporotondo, and the third the lands about Mascalucia, and afterwards the village of Misterbianco. Fourteen villages were altogether destroyed, and the lava was on its way to Catania. At Albanelli two miles from the city, it undermined a hill covered with corn fields, and carried it forward a considerable distance; a vineyard was also seen to be floating on its fiery surface. When the lava reached the walls of Catania, it accumulated without progression until it rose to the top of the wall, 60 feet in height, and it then fell over in a fiery cascade, and overwhelmed a part of the city. Another portion of the same stream threw down 120 feet of the wall, and flowed into the city. On the 23rd of April the lava reached the sea, which it entered as a stream 600 yards broad and 40 feet deep. The stream had moved at

the rate of 13 miles in twenty days, but as it cooled it moved less quickly, and during the last 23 days of its course it only moved two miles. On reaching the sea the water of course began to boil violently, and clouds of steam arose carrying with them particles of scoriæ. Towards the end of April the stream on the west side of Catania which had appeared to be consolidated, again burst forth, and flowed into the garden of the Benedictine Monastery of S. Nicoola, and then branched off into the city. Attempts were made to build walls to arrest its progress. An attempt of another kind was made by a gentleman of Catania, named Pappalardo, who took 50 men with him, having previously provided them with skins for protection from the intense heat, and with crow bars to effect an opening in the lava. They pierced the solid outer crust of solidfied lava, and a rivulet of the molten interior immediately gushed out, and flowed in the direction of Paterno. Whereupon 500 men of that town, alarmed for its safety, took up arms, and caused Pappalardo and his men to desist. The lava did not altogether stop for four months, and two years after it had ceased to flow, it was found to be red-hot beneath the surface. Even eight years after the eruption quantities of steam escaped from the lava after a shower of rain. The stones which were ejected from the crater during this eruption were often of considerable magnitude, and Borelli calculated that the diameter of one which he saw was 50 feet; it was thrown to a distance of a mile, and when it fell, it penetrated the earth to a depth of 23 feet. The volume of lava emitted during this eruption amounted to many millions of cubic feet; Ferrara considers that the length of the stream was at least 15 miles, while its average width was between 2 and 3 miles, so that it covered at least 40 square miles of surface.

1682. 43. For a few years after this terrible eruption Etna was quiescent, but in 1682 a new mouth opened on the east side of the mountain and little below the summit, and above the Val del Bove. Lava issued from it, and rushed down the precipices of the Val del Bove as far as the rock of Musarra.

1688. 44. Six years later a torrent of lava burst from an opening in the great cone, and flowed into the Val del Bove for a distance of three miles.

1689. 45. In the following year lava was emitted from a mouth in the Val del Bove, and it descended for about ten miles destroy-

ing everything in its course, until it reached a little valley near Macchia.

1693. 46. Early in January, 1693, clouds of black smoke were poured from the great crater, and loud noises resembling the discharge of artillery were heard. A violent earthquake succeeded, and Catania was shaken to the ground, burying 18000 of its inhabitants in the ruins. It is said that in all 50 towns were destroyed in Sicily, together with from 60,000 to 100,000 inhabitants. Lava was emitted from the crater, which was lowered by the eruption.

1694. 47. In the following year Etna again entered into eruption, ejecting large quantities of ashes, some of which were carried as far as Malta.

1702. 48. In March, 1702, three mouths opened in the Contrada del Trifoglietto, near the head of the Val del Bove. Lava was emitted from them, which flowed into the valley of Calanna.

1723. 49. Towards the end of 1723, loud bellowings issued from the mountain; earthquakes occurred, and a torrent of lava escaped from the crater, which flowed towards Bronte, through the Bosco di Bronte.

1732. 50. A small lava stream issued from the crater in 1732, and descended the western slope of the mountain, but without producing any damage.

1735. 51. In October, 1735, the usual noises which presage an eruption, were heard, earthquakes followed, and a little later the crater emitted flames, and red hot stones. Lava also issued from it, and the stream divided into three branches, one of which flowed towards Bronte, a second towards Linguaglossa, and a third towards Mascali; but they did not get beyond the upper regions of the mountain.

1744. 52. In 1744 the mountain threw out great quantities of ashes, but no lava.

1747. 53. In 1747 a quantity of lava flowed from the great crater into the Val del Bove, and the height of the cone was considerably increased during the eruption.

1755. 54. Early in the year 1755, Etna began to show signs of disturbance; a great column of black smoke issued from the crater, from which forked lightning was frequently emitted. Loud detonations were heard, and two streams of lava issued from the crater. A new mouth opened near the Rocca di Musarra in the Val del Bove, four miles from the summit, and a quantity of lava was ejected from it, An extraordinary flood

of water descended from the Val del Bove carrying all before it, and strewing its course with huge blocks. Recupero estimated the volume of water as 16,000,000 cubic feet, probably a greater amount than could be furnished by the melting of all the winter's snow on the mountain. It formed a channel two miles broad, and in some places thirty-four feet deep and it flowed at the rate of a mile in a minute and a half during the first twelve miles of its course. Lyell considers that the flood was probably produced by the melting not only of the winter's snow, but also of older layers of ice, which were suddenly melted by the permeation of hot steam and lava, and which had been previously preserved from melting by a deposit of sand and ashes, as in the case of the ancient glacier found near the summit of the mountain in 1828. In November, 1758, a smart shock of earthquake caused the cone of the great crater to fall in, but no eruption occurred at the time.

1759. 55. Great quantities of ashes, and some small streams of lava were emitted from the crater in 1759, a little later the cone which had been again raised by the eruption gave way, and the greater part of it fell into the crater. Two portions of it, however, were left standing.

1763. 56. Severe shocks of earthquake were felt on the east side of the mountain in 1763, and a new mouth opened in the Bosco di Bronte, ten miles from the town, between Monte Rosso and Monte Lepre. Four other mouths were afterwards opened in a line; they threw up quantities of scoriæ and ashes, and afterwards lava. In the middle of June, several mouths opened on the south side of the mountain, and a fissure 2000 feet long opened downwards in a southerly direction. The lava divided into two branches, the larger of which was ten miles long and 250 feet wide, with a depth of 25 feet.

1776. 57. Several new mouths opened in the spring of 1776, and ejected large volumes of ashes, also streams of lava, which flowed in the direction of Nicolosi and Pedara. The Canon Recupero, one of the historians of Etna, witnessed this eruption, and narrowly escaped been destroyed. He had ascended a small hill 50 feet high of ancient volcanic matter, in order to witness the approach of the lava stream which was slowly advancing with a front of two miles and a half. Suddenly two small streams detached themselves from the main stream, and ran rapidly towards the hill. Recupero and his guide at once hastened to descend, and had barely

escaped when they saw the hill surrounded by lava, and in a few minutes it was melted down and sank into the molten mass.

1780. 58. In the early part of 1780, earthquakes were felt all over Sicily, and on the 18th of May, a fissure opened on the south-west side of the mountain, and extended from the base of the great crater for seven miles terminating in a new mouth from which a stream of lava emanated. This encountered the cone of Palmintelli into its course and separated into two branches, each of which was 400 feet wide. Other mouths opened later in the year, and emitted large quantities of lava, which devastated the country of Montemazzo.

1781. 59. In 1781 the volcano emitted a quantity of lava, which flowed into the Val del Bove. Clouds of grey ashes were also ejected. At the commencement of the great Calabrian earthquake of 1783, Etna ejected large quantities of smoke, but it was otherwise quiescent.

1787 60. In the middle of 1787 lava burst from the great crater, which also discharged quantities of sand, scoriæ, and red-hot ashes. Large heated masses of rock were ejected to a great height, and subterranean bellowings were heard by the dwellers on the mountain.

1792 61. Five years afterwards a fresh outburst occurred, earthquakes were prevalent, and vast volumes of smoke bore to seaward, and seemed to bridge the sea between Sicily and Africa. A torrent of lava flowed towards Adernò, and a second flowed into the Val del Bove as far as Zoccolara. A pit called *La Cisterna*, 40 feet in diameter, opened in the Piano del Lago, near the great cone, and ejected smoke, and masses of old lava saturated with water. Several mouths opened below the crater and the country round about Zaffarana was desolated. The Abatè Ferrara, the author of the *Descrizione dell' Etna* witnessed this eruption:—"I shall never forget," he writes, "that this last mouth opened precisely in the spot where the day before, I had made my meal with a shepherd. On my return next day he related how, after a stunning explosion, the rocks on which we had sat together were blown into the air, and a mouth opened, discharging a flood of fire, which rushing down with the rapidity of water, hardly gave him time to make his escape."

1797 62. In 1797 a slight eruption occurred, and the great crater threw out ashes and sand, but no lava. Earthquakes were frequent.

1798 63. In the following year lava was emitted, and severe earthquakes occurred.

1799 64. The eruptions continued during 1799.

1800 65. In February, 1800, loud explosions were heard by the dwellers on the mountain, and colums of fire issued from the crater, accompanied by forked lightning. This was succeeded by a discharge of hot ashes and scoriæ, which falling on the snows accumulated near the summit of the mountain, produced devastating floods of water.

1802 66. In November, 1802, a new mouth opened near the Rocca di Musarra in the Val del Bove, which emitted a copious stream of lava. In a day and a half the lava had run twelve miles.

1805 67. In 1805 the great crater was in a state of eruption, and a cone was thrown up within it to a height of 1050 feet.

1808 68. In 1808 the mountain again became active, and fire and smoke were emitted from the crater.

1809 69. In March, 1809, no less than twenty-one mouths of fire opened in the direction of Castiglione. They ejected volumes of smoke, large quantities of scoriæ and ashes, and afterwards lava, which uniting into one torrent flowed with a front of 450 feet for 8 miles. Fissures were formed in the earth, and loud explosions constantly occurred. Within the great crater a small cone was thrown up.

1811 70. Two years afterwards more than thirty mouths opened in a line running eastwards for five miles. They ejected jets of fire accompanied by much smoke. The eruption soon diminished in the higher mouths, and became more and more violent in the lower mouths, until the eruption centred in the lowest one called S. Simone, near the head of the Val del Bove. From this great black clouds, having a lustre like that of black wool, issued, and afterwards quantities of lava, which formed a stream a mile wide, and 8 miles long. It flowed nearly as far as the village of Milo. Frequent earthquakes accompanied this outburst, and they continued in various parts of the island, for the following five years.

1819 71. In 1819 five new mouths of fire opened near the scene of the eruption of 1811; three of these united into one large crater, and poured forth a quantity of lava into the Val del Bove. The lava flowed until it reached a nearly perpendicular precipice and at the head of the Valley of Calanna, over which it fell in a cascade, and being hardened by its descent, it was forced against the sides of the tufaceous rock at the bottom, so

as to produce an extraordinary amount of abrasion, accompanied hy clouds of dust, worn off by the friction. Mr. Scrope observed that the lava flowed at the rate of about a yard an hour, nine months aftes its emission.

1831 72. A slight eruption occurred in 1831 from the great crater, which threw out lava on its northern side.

1832 73. In October of the following year a violent eruption occurred. A new crater was formed in the Val del Serbo, above Bronte, and three miles from the summit Seven mouths afterwards opened, three miles below the first. From one of these lava was emitted, which flowed to within a mile and a half of Bronte. The stream was a mile and a half broad, and 40 feet deep.

1838 74. A slight eruption occurred in 1838, when a small quantity of lava was poured from the great crater into the Val del Bove.

1842 75. Four years later the crater discharged ashes and scoriæ, and lava burst from the cone three hundred feet from the summit. It flowed into the Val del Bove, in a stream 600 feet wide, and it came to a standstill ten miles from the summit.

1843 76. Near the end of the following year fifteen mouths of fire opened near the [illegible]ter by 1832, at a height of 7000 feet above the sea. They began by discharging scoriæ and sand, and afterwards lava, which divided into three streams, the two outer ones soon came to a standstill, while the central stream continued to flow at the rapid rate of 180 feet a minute, the descent being an angle of 25°. The heat at a distance of 120 feet from the current was 90°F. A new crater opened just above Bronte, and discharged lava which threatened the town, but it fortunately encountered Monte Vittoria and was diverted into another course. While a number of the inhabitants of Bronte were watching the progress of the lava, the front of the stream was suddenly blown out, as by an explosion of gunpowder; in an instant red hot masses were hurled in every direction; and a cloud of vapour enveloped everything. Thirty six persons were killed on the spot, and twenty survived but a few hours. The great crater showed signs of disturbance, by emitting dense volumns of smoke, and loud bellowings, also quantities of volcanic dust saturated with hydrochloric acid, which destroyed the vegetation wherever it fell.

1852 77. A very violent eruption which lasted more than nine months, commenced on the 20th of August, 1852. It was first witnessed by a party of six English tourists, who were ascend-

ing the mountain from Nicolosi in order to witness the sunrise from the summit. As they approached the Casa Inglesi the crater commenced to give forth ashes and flames of fire. In a narrow defile they were met by a violent hurricane, which overthrew both the mules and their riders, and urged them towards the precipices of the Val del Bove. They sheltered themselves beneath some masses of lava, when suddenly an earthquake shook the mountain, and their mules in terror fled away. They returned on foot towards daylight to Nicolosi, fortunately without having sustained injury. In the course of the night many *bocche del fuoco* opened in that part of the Val del Bove called the Balzo di Trifogliotto, and a great fissure opened at the base of the Giannicola Grande, and a crater was thrown up, from which for seventeen days showers of sand and scoriæ were ejected. During the next day a quantity of lava flowed down the Val del Bove, branching off, so that one stream flowed to the foot of Monte Finocchio, while the other flowed to Monte Calanna. Afterwards it flowed towards Zaffarana, and devastated a large tract of woody region. Four days later a second crater was formed near the first, from which lava was emitted together with sand and scoriæ, which caused cones to rise around the craters. The lava moved but slowly, and towards the end of August it came to a stand only a quarter of a mile from Zaffarana: on the second of September Gemellaro ascended Monte Finocchio in the Val del Bove in order to witness the outburst. He states that the hill was violently agitated, like a ship at sea. The surface of the Val del Bove appeared like a molten lake; scoriæ were thrown up from the craters to a great height, and loud explosions were heard at frequent intervals. The eruption continued to increase in violence. On October 6th two new mouths opened in the Val del Bove, emitting lava which flowed towards the valley of Calanna, and fell over the Salto della Giumenta, a precipice 400 feet deep. The noise which it produced was like that of the clash of metallic masses. The eruption continued with abated violence during the early months of 1853, and it did not finally cease till May 27th. The entire mass of lava ejected is estimated to be equal to an area six miles long by two miles broad, with an average depth of about twelve feet.

1865. 78. In October 1864 frequent shocks of earthquakes were felt by the dwellers on Etna. In January clouds of smoke were emitted by the great crater, and roaring sounds were heard.

On the night of the 30th a violent shock was felt on the north east side of the mountain, and a mouth opened below Monte Frumento, from which lava was ejected. It flowed at a rate of about a mile a day, and ultimately divided into two streams. By March 10th the new mouths of fire had increased to seven in number, and they were all situated along a line stretching down from the summit. The three upper craters gave forth loud detonations three or four times a minute. Since 1865 the mountain has been in a quiescent state.

General character of the eruptions.

It will be seen from the foregoing account that there is a great similarity in the character of the eruptions of Etna. Earthquakes presage the outburst; loud explosions follow; rifts and *bocche del fuoco* open in the sides of the mountain, smoke, sand, ashes, and scoriæ are discharged, the action localises itself in one or more craters, cinders are thrown up, and accumulate around the crater as a cone, ultimately lava is emitted, which frequently breaks down one side of the cone, where the resistance is least. Then the eruption is at an end.

Out of the 78 eruptions which we have described above it will be seen that not more than 15 have been of extreme violence, while many of them have been of a very slight and harmless character.

Age of Etna.

According to Lyell, Etna is rather older than Vesuvius; perhaps of the same age as the Norwich crag. At Trezza on the eastern base of Etna, basaltic rocks occur associated with fossiliferous pliocene clays. The earliest eruptions of Etna, are older than the glacial period in central and northern Europe. At a remote period, the eastern flanks of Etna must have undergone a great amount of erosion, as their are vast deposits of alluvial matter sometimes attaining a depth of 400 feet, between Giarre and Mangano. A volcanic cone grows like a tree, cone upon cone of new matter is added, and as the base of Etna is 87 miles in circumference, an enormous time must have been required to extend it to its present dimensions. If all the minor cones and monticules could be stripped from the mountain, the diminution of bulk would be extremely slight. Lyell concludes that although no approximation can be given of the age of Etna "its foundations were laid in the sea in the newer Pliocene period." From the slope of the strata from one central point in the Val del Bove, he further concludes that there once existed a second great crater of permanent eruption.

FEBRUARY, 1877.

Day of Month.	Mean Readg. of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean Amt. of Cloud (0-10).	Rain.
	in.	°	°	°	°	°					in.
1	30·062	49·1	41·3	45·8	61·5	40·2	W.	W.	107	10·0	·07
2	·076	52·0	41·2	45·8	55·6	37·2	S.S.W.	W.	215	5·0	·14
3	·184	48·8	35·4	41·4	90·7	29·2	S.S.W.	W.	182	8·0	·10
4	·270	47·6	34·8	38·8	90·0	28·7	N.W.	W.	184	0·0	
5	·333	48·1	32·8	41·9	65·7	28·7	S.W.	S.W.	159	9·7	·02
6	·277	51·6	46·6	48·8	58·3	42·7	S.W.	W.	172	10·0	·01
7	·227	56·2	47·1	50·8	84·8	43·0	W.	W.	315	9·5	·12
8	·229	50·2	38·6	42·7	86·9	36·4	W.	W.	93	9·5	
9	30·092	50·4	40·3	45·4	61·0	39·5	S.W.	S.W.	180	10·0	
10	29·986	49·8	47·1	49·3	52·0	43·2	N.W.	N.W.	847	10·0	·03
11	·935	53·8	44·0	47·5	97·6	40·5	N.W.	N.W.	300	4·0	·11
12	·800	52·1	44·0	47·1	79·7	40·3	S.W.	S.W.	238	10·0	·12
13	29·845	51·5	44·1	47·7	56·1	40·7	W.	N.W.	245	10·0	·10
14	30·046	53·7	46·6	49·1	71·8	45·3	W.	W.	184	6·3	
15	29·848	50·2	45·3	47·5	71·1	40·9	S.S.W.	S.W.	164	10·0	·08
16	29·903	49·8	34·3	39·6	98·2	32·2	W.	W.	212	0·0	
17	30·087	51·5	36·3	42·9	104·7	33·5	W.	W.	146	8·0	
18	30·053	48·1	41·7	45·0	58·0	39·2	S.W.	S.W.	137	9·7	·11
19	29·769	47·7	36·7	41·2	99·5	33·3	W.	S.W.	197	6·0	·36
20	·461	46·3	35·3	39·4	91·2	33·2	N.W.	N.W.	416	9·0	·04
21	·933	43·9	36·1	38·5	91·7	30·5	N.W.	N.W.	209	5·7	
22	·940	43·1	31·3	36·6	92·6	27·8	N.W.	N.W.	159	5·0	·09
23	·998	42·3	33·6	37·0	67·0	29·6	N.W.	N.W.	123	10·0	·01
24	·699	48·7	34·5	43·0	70·3	34·2	W.	N.W.	207	8·0	
25	·457	49·9	43·2	46·3	73·0	39·1	W.	S.W.	830	9·3	·08
26	·550	45·3	30·6	36·6	86·5	23·8	W.	W.	831	5·0	·01
27	29·974	41·4	27·7	33·2	90·2	23·6	W.	W.	163	4·5	·01
28	30·324	38·2	24·7	30·7	85·8	20·9	N.W.	N.W.	135	0·5	
Mns.	29·977	48·6	38·4	42·8	78·3	34·9	...	...	Sum 7350	7·2	Sum 1·61

MARCH, 1877.

Day of Month	Mean Readg of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10).	Rain.
	in.	°	°	°	°	°					
1	30·373	45·3	20·8	34·0	91·7	21.5	N.W.	S.W.	58	5·0	·03
2	·228	51·9	38·4	46·3	64·4	38·0	S.W.	W.	130	10·0	·03
3	30·107	51·7	43·6	46·6	67·7	40·0	S.	S.W	97	10·0	·10
4	29·927	46·0	38·4	42·1	60·6	34·6	N.	N.W.	121	7·5	
5	·962	47·6	31·7	38·7	100·2	28·3	N.W.	N.W.	115	6·5	·04
6	·892	44 9	31·5	37·8	89·1	29·0	N.W.	W.	106	5·0	·05
7	29·572	40·7	32·9	36·2	72·0	32·3	N.W.	N.	269	9·5	·07
8	30 066	40·2	29·7	33·8	81·2	24·8	N.	N.W.	166	0·0	
9	·136	40·7	27·1	34·5	81·2	18·5	N.	S.	71	5·5	·07
10	·109	40·0	31·7	34·3	80·5	33·2	S.E.	S.E.	115	10·0	
11	30·228	44·4	25·8	34·2	91·8	22·7	N.E.	S.E.	78	0·0	·04
12	29·865	48·1	32·5	41·5	61·0	28·0	S.W.	W.	259	9·7	
13	·910	51·6	41·7	46·8	75·4	35·1	W.	W.	298	5·0	
14	·979	52·6	44·0	46·8	91·1	37·6	W.	W.	239	9·5	
15	·856	50·9	36·6	43·7	99·0	31·8	W.	W.	193	7·0	·09
16	·593	47·7	34·6	39·5	103·5	30·0	S.W.	N.W.	279	6·0	·01
17	·648	47·1	30·6	37·8	102·7	24·5	W.	W.	139	0·1	
18	·659	49·2	30·0	39·1	102·3	23·0	W.	W.	134	0·5	·28
19	·573	44·1	26·9	36·0	87·5	19·2	N.	N.	65	1·0	
20	·386	39·5	30·8	34·6	56·9	27·3	N.	N.	193	10·0	
21	·478	44·4	30·4	35·8	92·8	25·5	N.	W.	128	2·5	
22	·784	48·9	26·7	35·8	101·6	22·2	W.	W.	63	4·5	
23	·572	46·6	25·0	36·5	90·8	21·2	S.	S.	110	10·0	·37
24	29·110	49·8	33·9	42·5	96·9	30·4	S.W.	S.	185	8.0	·30
25	28·979	49 8	39·1	43·6	93·6	35·2	S.	N.E.	196	8·5	·01
26	29·185	48·2	39·3	42·5	75·1	34·2	N.E.	W.	91	10·0	·31
27	·396	49·5	31·5	40·7	82·8	26·2	W.	W.	101	4·5	·16
28	·778	55·9	36·3	45·4	107·5	29·9	S.	W.	116	7·5	·14
29	29·874	57·2	41·8	47·4	103·0	35·2	E.	W.	57	9·5	·30
30	30·057	57·8	41·9	47·3	111·9	32·4	W.	N.W.	107	4·7	
31	30·132	51·7	37·4	45·7	96·0	29·4	W.	W.	188	7·5	·01
Mns	29·789	47·9	33·6	40·2	87·5	29·1	...	...	Sum 4467	6·3	Sum 2·41

APRIL, 1877.

Day of Month.	Mean Readg. of Baromtr reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst. insun's rays.	Lowst. on the Grass.	Direction of the wind. A.M.	P.M.	Velocity. Miles.	Mean Amt. of Cloud (0-10).	Rain.
	in.	°	°	°	°	°					in.
1	30·041	55·3	45·0	49·6	86·1	43·7	W.	W.	219	10·0	·02
2	29·917	56·7	44·0	49·6	88·0	40·6	N.	S.W.	110	10·0	
3	·817	52·5	45·0	49·3	79·3	41·9	S.	S.	192	10·0	·55
4	·131	52·9	40·7	46·0	80·9	36·7	S.E.	S.E.	723	6·2	·50
5	·329	48·4	38·2	43·5	99·2	31·5	S.	Calm	175	3·5	·34
6	·487	50·7	37·6	44·3	108·2	30·7	S.	W.	105	7·0	·32
7	·634	52·3	36·1	44·7	98·0	30·2	S.	S.	108	4·5	·12
8	·622	52·3	41·0	47·1	83·0	34·7	S.	N.E.	113	9·5	·10
9	·558	54·7	45·1	48·9	84·0	45·4	S.	W.	66	10·0	·22
10	·581	59·0	42·4	49·9	112·2	39·7	W.	W.	69	6·0	·04
11	29·771	57·0	45·3	48·8	116·0	41·8	N.	N.E.	95	9·5	·03
12	30·035	50·0	36·0	43·0	89·6	33·7	E.	S.E.	137	4·5	
13	·010	53·2	38·9	45·7	73·8	34·5	S.	N.W.	51	10·0	·07
14	30·122	56·0	37·4	45·9	80·5	32·6	E.	N.E.	51	5·0	
15	29·927	53·0	40·9	46·9	82·6	38·4	S.E.	N.E.	716	9·5	·02
16	·629	48·1	38·9	42·5	75·0	33·2	E.	E.	809	5·0	
17	·629	44·7	30·2	38·0	86·5	30·2	E.	E.	905	9·5	·05
18	29·684	42·3	34·6	38·6	67·2	32·2	N.	N.	710	9·5	·01
19	30·034	50·2	37·2	42·9	103·2	34·5	N.	N.	184	9·5	
20	30·234	54·7	30·7	41·9	108·2	23·0	E.	S.W.	86	9·0	·21
21	29·886	57·1	41·5	47·8	86·8	40·2	S.	W.	161	10·0	·34
22	·655	59·5	45·0	48·9	104·5	42·5	W.	W.	153	9·5	·09
23	·583	52·2	35·5	43·6	108·8	33·7	W.	W.	144	7·5	·11
24	·742	55·2	33·6	44·8	116·2	27·8	E.	E.	35	8·5	
25	·914	54·7	37·9	44·1	113·5	29·7	E.	E.	135	4·5	
26	·952	49·2	32·8	41·7	83·3	26·5	E.	E.	148	4·8	
27	·798	49·5	36·4	43·1	94·1	31·4	E.	E.	291	10·0	·53
28	·796	46·0	38·0	41·3	66·5	37·8	E.	N.	166	10·0	
29	29·906	48·8	37·4	42·6	79·0	37·4	E.	N.	130	10·0	
30	30·195	50·4	37·3	42·7	115·7	35·2	N.	N.	118	5·0	
Mns	29·770	52·2	38·7	44·9	92·3	35·0	...	...	Sum 7105	7·9	Sum 3·67

MAY, 1877.

Day of Month	Mean Readg of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10).	Rain.
	in.	°	°	°	°	°					in.
1	30·412	46·1	33·9	40·5	87·0	29.7	N.E.	E.	113	7·5	
2	·276	51·7	31·5	42·7	108·2	24 7	S.E.	W.	36	6·0	
3	·140	49·7	34·8	40·6	96 6	29·6	N.E.	N.	135	4·5	
4	30·039	48·8	27·7	38·3	114·3	18·5	E.	N.	154	2·0	
5	29·878	51·3	25·8	39·5	106·9	17·4	N.	N.	100	2·5	
6	·836	54 9	28·5	42·2	107·4	21 0	E.	N.E.	128	3·0	
7	·807	61·8	31·4	46·9	115·8	21·3	N.	N.W.	66	1·0	
8	·683	63·6	34·6	50·7	116·2	25·9	E.	W.	93	3·5	
9	·503	60·2	43·7	51·8	117·5	38·2	S.	S.W.	135	8·5	·06
10	·539	58·6	44·0	50·9	115·4	39·1	S.	N.	112	9·5	·19
11	·549	59·1	44·6	50·5	114·6	43·4	E.	E.	63	10·0	·02
12	·590	59·1	43·7	50·0	94·6	44·0	E.	S.W.	56	10·0	·47
13	·714	59·0	45·3	51·3	101·3	42·2	W.	W.	54	8·0	
14	·644	55·9	43·9	50·4	95·8	37·5	S.	S.W.	105	9·5	·07
15	29·954	60·9	46·0	51·5	117·8	38·9	W.	W.	163	3·5	
16	30·070	61·8	41·5	52·2	116·5	35·3	S.	S.	134	9·5	·46
17	29·803	57·7	47·9	50·8	84·0	47·4	S.E.	W.	223	5·0	·10
18	·992	58·0	43·9	51·4	112·3	37·2	W.	N.W.	282	6·5	
19	29 908	55·7	44·0	49·3	97·9	38·3	W.	W.	222	10·0	·18
20	30·115	53·7	45·1	47·7	97·8	42·8	N.	N.	237	10·0	
21	·262	55·2	43·1	48·7	90·5	39 7	N.	N.	109	9·5	·01
22	·270	50·0	42·4	45·5	79·0	40·2	N.	N.	127	10·0	
23	·254	49·8	39·3	43·8	85·0	36·7	N.	N.	128	9.5	
24	·251	51·9	35·6	43·8	78·7	26·2	N.	N.	90	5·0	
25	·241	61 9	31·6	49 9	115·4	25·2	N.	N.	33	5·5	
26	30·144	64·5	47·0	54·9	113·4	39·1	N.	W.	62	1·0	
27	29·692	61·0	41·2	51·7	116·5	30 6	S.W.	S.W.	189	9·5	·26
28	·325	57·9	48·7	52·3	110·5	43·2	S.W.	W.	340	7·5	·25
29	·562	58·7	43·3	50·1	117·4	36·1	S.W.	W.	160	6·0	·13
30	·644	58 9	40 9	50·4	117·4	34·4	S.W.	W.	117	4·5	·04
31	29·584	62·5	42·7	53·4	122·8	35·4	E.	S.	108	10·0	·35
Mns	29·893	56·8	39·9	48·2	105·3	34·2	...	...	Sum 4074	6·7	Sum 2·59

JUNE, 1877.

Day of Month.	Mean Readg. of Barometr reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays.	Lowst on the Grass.	Direction of the wind. A.M.	P.M.	Velocity Miles.	Mean Amt. of Cloud (0-10).	Rain.
	in.	°	°	°	°	°					in.
1	29·527	57·2	50·1	52·4	103·0	47·1	S.W.	S.W.	312	10·0	·56
2	·880	58·7	50·2	54·1	89·9	46·1	S.W.	S.W.	803	10·0	
3	·746	75·3	47·3	61·4	124·2	43·3	S.E.	S.W.	190	1·0	
4	·738	76·7	50·8	62·2	129·4	44·8	S.	S.W.	130	8·5	
5	·993	64·6	50·7	55·7	126·2	47·0	S W.	S.	705	4·5	·01
6	29 991	55·5	45·9	50·3	85·1	41·5	S.	S.W.	226	5·0	·14
7	30·206	64·5	43·1	53·8	121·5	42·2	S.W.	W.	143	8·0	
8	·068	69·0	47·4	58·4	118·2	44·2	S.	S.	100	7·7	
9	·131	71·6	50·1	60·1	125·1	42·7	S.W.	W.	195	0·5	
10	·124	74 0	48·6	61·1	126 8	42·9	S.	W.	10	0·5	
11	30·061	77·9	48·4	64·5	131·0	44·3	W.	N.	33	5·0	·03
12	29·898	71·0	59·1	63·6	116·0	57·2	N.	N.	103	10·0	
13	30·030	61·9	53·8	57·5	73·0	53·3	N.	E.	87	10·0	
14	·114	69·6	51·8	59·2	118·0	49·0	E.	E.	178	4·5	
15	·175	73·4	50·1	60·3	122·5	45·4	E.	E.	163	1·5	
16	·129	75·9	47·8	62·5	124·9	42·9	E.	N.E.	175	0·0	
17	·057	76·5	50·7	63·0	129·4	44·8	N.E.	N.E.	139	0·0	
18	·078	81·8	52·6	67·4	137·0	43·8	N.E.	E.	37	1·5	
19	·114	80·6	54·7	68·3	136·9	47·4	E.	N.	115	2·0	
20	30·033	76·9	56·1	67·1	129·0	51·3	E.	S.	75	6 5	
21	29·822	73·5	55·5	64·0	130 2	51·2	E.	S.E.	81	8·0	·06
22	·607	68·9	55·8	60·6	133·3	51·7	S.	S.W.	142	10·0	·04
23	29·893	63·6	51·7	55·4	123·7	47·3	W.	N.W.	164	9·5	
24	30·166	65·4	40·7	54·8	129 3	32·2	N.W.	S.W.	67	7·0	
25	·185	69·7	44·1	58·0	130·4	37·3	N.W.	S.W.	114	3·0	
26	·133	66·7	50·9	58 3	111·8	46·2	S.W.	N.W.	163	6·5	·06
27	·200	68·9	54·3	60·5	123·0	48·6	N.W.	N.	79	3·5	
28	·272	76 0	44·9	62·2	126·7	39·5	N.W.	W.	33	3·0	
29	·249	79·4	54 2	66·3	133·0	49·5	S.W.	W.	93	0·3	
30	30·187	70·9	51 8	63·0	101 9	44·3	N.W.	N.W.	89	9·5	·22
Mns	30·027	70·5	50·4	60·2	120·3	45·7	...	...	Sum 4911	5·2	Sum 1·12

JULY, 1877:

Day of Month.	Mean Readg of Baromtr. reduced to Sea Level.	Temperature. In the shade.			Highst insun's rays.	Lowst. on the grass.	Wind. Direction.		Velocity. Miles.	Mean Amt. of Cloud (0-10).	Rain.
		Highest.	Lowest.	Adopted Mean.			A.M.	P.M.			
	in.	°	°	°	°	°					in.
1	30·056	64·7	53·9	57·4	102·5	53·9	N.W.	N.W.	93	8·0	·01
2	·035	69·4	47·0	57·6	124 3	39 9	W.	W.	163	5·0	·01
3	·022	67·6	48·3	58·1	122·7	39·1	W.	W.	145	6·0	·28
4	30·004	68·4	51.4	57·5	132·6	46·2	W.	S.W.	125	3·0	
5	29·936	66·7	42·8	55·2	128·0	33·9	W.	S.	69	4·5	·29
6	29 971	63·7	42·7	53·3	122·3	36·0	S.W.	W.	94	4·0	·02
7	30·197	63·6	41·4	53·3	126·1	33·0	W.	N.	98	3·0	·04
8	·290	65·0	42·0	55·4	130·4	33·6	W.	W.	98	3·5	·03
9	·323	65·4	45·9	56 3	114 7	36·2	W.	W.	143	10 0	·01
10	·210	72·7	45·6	59·8	129·8	39·4	S.W.	S.W.	148	7·3	
11	30·094	70·2	52·1	59·8	123·5	44·1	S.W.	W.	114	8·5	
12	29·954	71·7	45·0	59 6	131·4	36·0	N.	N.W.	49	3·0	
13	·774	69·5	47·5	60·0	121·4	38·2	S.W.	S.W.	97	9·5	·11
14	·383	65·8	57·9	61·2	114 3	57·6	S.	S.E.	138	10·0	1·95
15	·283	64·7	54·1	58·2	118·4	53·1	S.W.	S.W.	200	8·0	·46
16	·330	64·5	53·6	57·8	105·7	50·4	S.W.	S.W.	183	10·0	·26
17	·646	59·3	54·5	56·2	85·4	51·4	S.W.	N.W.	234	8·5	·06
18	·896	64·7	50·0	57·5	124·1	44·1	W.	W.	139	10.0	·02
19	29·850	68·1	(54·0)	59·9	108·8	53·1	S.W.	S.W.	94	10·0	·02
20	30 018	64·6	51·1	56·7	124·9	41·7	N.W.	W.	168	5·5	
21	29·997	64·7	48·0	57·9	118·1	40·4	S.W.	S.W.	136	5·0	
22	·776	65·3	52·8	59·9	107·7	48·1	S.W.	S.W.	160	10·0	·04
23	·541	64·9	58·3	60·9	84·0	54·8	S.	S.W.	244	10·0	1·05
24	·667	65·9	50·0	58·3	119·5	41·6	S.W.	W.	130	8·7	·03
25	·954	66·7	50·6	57·9	113·7	41·8	W.	W.	104	10·0	·31
26	29·987	71·7	54·0	60·9	127·6	53 9	W.	W.	236	6·0	
27	30·180	70·7	51·8	60·4	127·7	43·1	W.	W.	64	5·5	
28	·198	66·6	48·6	59·1	84·5	39·2	W.	W.	115	10·0	
29	·303	76·7	58·2	66·1	134·0	53·8	W.	W.	159	2·7	
30	30·268	79·7	55·2	65·4	127·4	55·7	W.	W.	75	5·0	
31	29·960	82·5	55·4	67·9	141·6	45·8	N.W.	N.W.	67	7·5	·03
Mns.	29·939	67·9	50·4	58·9	118·6	44·6	...	...	Sum 4082	7·0	Sum 5·03

AUGUST, 1877.

Day of Month.	Mean Readg. of Barometr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst. in sun's rays	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean Amt. of Cloud (0-10).	Rain.
	in.	°	°	°	°	°					in.
1	29·956	68·5	49·8	56·4	119·7	41·1	N.	W.	136	4·5	
2	30·021	66·7	47·5	56·4	126·0	40·7	N.	N.W.	116	1·5	
3	·036	64·7	45·2	56·3	123·8	34·0	N.	N.W.	135	9·0	
4	·075	68·5	49·6	59·1	120·0	41·9	N.W.	N.W.	43	8·5	
5	30·016	74·1	47·3	61·4	132 0	37·2	S.W.	S.E.	64	1·7	
6	29 907	74·0	55·0	64·8	126·8	47·5	S.	S.	90	9·5	·13
7	·563	64·7	55·1	59·7	82·4	46·2	S.	S.W.	182	5·0	·45
8	·410	65·0	54·9	59 1	115·7	48·1	S.W.	W.	249	8·5	·52
9	·706	67·1	56·1	60 6	119 6	54·6	S.W.	S.W.	215	9 5	·05
10	29·909	66·3	51 9	58·9	125·8	46·3	S.	W.	80	5·0	
11	30·062	66·1	46·7	56 7	105·6	41·1	S.W.	N.	96	8·0	
12	30·086	68·2	50 3	60·7	125·0	44·7	N.E.	N.	51	5·0	
13	29·938	70·7	51·9	61·5	118·0	46·0	N.	N.	86	9·5	
14	·842	73·7	57·9	63·8	114·4	53·6	E.	S.	72	9·5	·90
15	·945	72 5	57·7	62·9	124·7	55·5	S.	W.	91	5·3	
16	29·931	71·0	57·4	62·6	128·4	54·9	S.W.	W.	102	6·7	·23
17	30·010	71·7	52·5	60·4	130·8	45·1	S.W.	W.	138	4·0	
18	29·996	70·7	53 5	62·0	116·0	48·5	S.	N.E.	63	7·5	·34
19	·828	68·8	58·8	63·9	86·6	58·2	S.W.	N.W.	90	10·0	·10
20	·722	77·3	60·8	67·9	130·0	60·9	S.	S.W.	133	4·0	·02
21	·632	69·7	58 0	62·3	125·5	54·2	S.W.	W.	216	5·5	·46
22	29·696	67·0	51·7	58·3	124·0	47·9	S.W.	S.W.	81	4·0	
23	30·091	61·4	44·8	53·5	124·0	38·1	W.	W.	207	4·5	·01
24	30·143	65·5	36·2	53·3	118·6	31·7	S.	W.	41	5·5	·05
25	29·649	62·0	50·9	57·2	94·8	49·3	E.	S.E.	173	10·0	·67
26	·816	64·7	56·5	60·1	103·0	54·9	W.	W.	147	9·5	·43
27	·821	67·9	55·2	62·0	109·3	54·7	S.W.	S.W.	211	10·0	·26
28	·757	68·4	57·6	61·6	117·2	54·3	S.W.	W.	262	8·5	
29	·987	69·4	54·1	60·9	126·0	47·2	W.	W.	110	6·5	·01
30	·873	65·9	51·1	57·2	119·0	46·9	S.W,	W.	162	8·5	
31	29·960	60·9	47·7	53·3	115·0	41·5	S.W.	S.W.	166	4·0	·18
Mns.	29·883	68·3	52·4	59·8	117·7	47·3	...	...	Sum 4008	6·4	Sum 4·81

SEPTEMBER, 1877.

Day of Month.	Mean Readg. of Baromtr reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays.	Lowst on the Grass.	Direction of the wind. A.M.	P.M.	Velocity Miles.	Mean Amt. of Cloud (0-10).	Rain.
	in.	°	°	°	°	°					in.
1	30·116	63·5	40·8	52·0	120·7	33·6	N.W.	N.W.	80	0·5	
2	29·923	62·5	43·0	53·7	121·7	37·1	S.W.	N.	72	8·5	·50
3	29·929	52·5	44·0	47·6	56·2	43·2	N.	N.W.	163	10·0	1·26
4	30·352	62·2	39·1	50·3	116·7	31·5	N.	N.W.	72	0·7	
5	30·292	64·9	35·1	51·7	116·7	30·6	W.	N.W.	36	1·5	
6	29·978	66·5	38·0	53·3	124·6	30·6	S.W.	S.W.	26	2·0	
7	·870	63·1	43·3	53·3	112·9	38·0	N.E.	N.E.	60	1·0	
8	29·983	60·0	43·1	52·1	102·0	38·3	N.E.	N.E.	238	7·7	
9	30·013	62·7	49·1	55·1	98·0	46·6	N.E.	N.E.	153	10·0	
10	30·004	66·4	47·7	56·6	113·7	40·1	E.	S.	138	10·0	
11	29·765	63·5	55·2	59·1	87·5	50·1	S.	S.W.	429	5·3	·87
12	·881	63·8	54·3	58·3	114·7	48·8	S.W.	S.W.	414	8.7	
13	·970	61·2	51·4	57·1	76·5	44·8	S.W.	S.W.	215	9·0	·07
14	29·964	64·5	57·9	60·2	96·8	53·7	S.W.	S.W.	229	10·0	·22
15	30·035	65·5	48·8	55·5	118·5	38·5	W.	N.W.	194	5·5	
16	·333	64·7	42·7	53·7	119·7	33·6	N.E.	N.E.	51	2·0	
17	·372	54·8	44·5	50·8	120·0	33·8	N.	N.	34	7·0	
18	·326	59·8	50·0	53·8	110·7	45·5	N.	N.	104	8·5	
19	30·075	61·6	51·6	56·4	103·8	47·4	N.W.	N.W.	87	3·0	
20	29·829	58·2	47·9	52·2	78·8	45·3	W.	N.W.	67	9·7	
21	29·898	55·9	37·7	46·3	110·1	30·1	N.	N.	72	1·5	
22	30·012	54·9	37·3	45·5	106·7	32·1	N.	N.	72	1·7	
23	29·981	57·5	38·9	48·4	95·2	31·2	N.	N.	89	9·3	·03
24	30·141	59·0	39·2	47·8	112·5	31·9	N.	N.	30	4·7	
25	·247	54·9	33·1	45·5	78·1	27·8	N.	N.	30	9·7	
26	·337	62·7	43·0	50 8	120·9	33·9	N.	N.	26	3·0	
27	·406	63·1	35·2	47·7	103·7	30·6	E.	E.	11	9·7	
28	·340	62·2	39·3	48·3	114·7	30·7	N.E.	N.E.	52	9·5	
29	·234	60·6	39·1	48·7	102·6	29·6	E.	E.	80	5·0	
30	30·216	61·4	44·2	49·5	117·0	35·4	E.	N.	85	5·0	
Mns	30·094	61·1	43·8	52·0	105·7	37·5	...	...	Sum 3409	6·0	Sum 2·95

OCTOBER, 1877.

Day of Month.	Mean Readg. of Baromtr. reduced to Sea Level.	Temperature.					Wind.			Mean Amt. of Cloud (0-10).	Rain.
		In the Shade.			Highst insun's rays	Lowst. on the grass.	Direction.		Velocity. Miles.		
		Highest.	Lowest.	Adopted Mean.			A.M.	P.M.			
	in.	°	°	°	°	°					in.
1	30·211	62·0	36·5	47·9	107·7	30·3	N.	N.	31	1·0	
2	·070	62·7	34·3	47·5	117·0	27·9	N.	E.	20	0·0	
3	·063	60·9	31·7	44·6	99·7	25·7	E.	E.	38	0·0	
4	·260	61·3	32·2	46·2	110·9	25·6	N.E.	N.E.	7	2·5	
5	·519	61·5	32·0	47·0	112·7	24·4	N.E.	N.E.	50	0·0	
6	·666	61·0	32·4	47·8	112·7	23·4	N.E.	N.E.	50	3·0	
7	·473	57·1	33·1	46·0	79·8	26·4	N.E.	N.	50	8·0	
8	·278	55·7	42·7	48·4	94·3	34·0	N.	N.	112	5·0	
9	·350	53·5	35·4	44·0	99·9	29·5	N.	N.	98	0.0	
10	30·055	52·0	37·0	46·0	60·2	27·4	S.W.	S.W.	97	10·0	·14
11	29·979	56·4	42·4	48·7	107·7	32·6	W.	S.W.	140	4·5	
12	30·008	57·7	42·2	49·5	105·7	35·4	S.W.	S.W.	178	6·5	·16
13	29·869	60·5	46·3	54·3	103·6	44·3	S.W.	N.W.	216	10·0	
14	·650	66·1	54·2	60·2	113·7	46·6	S.W.	S.W.	237	2·5	
15	29·874	63·8	42·0	49·2	103·7	37·1	S.W.	S.W.	870	6·5	·15
16	30·242	50·7	34·3	41·2	92·5	25·9	S.W.	S.W.	171	3·5	·07
17	·425	53·6	29·6	40·0	102·7	19·6	S.W.	S.W.	86	0·1	
18	·376	54·9	24·5	36·0	102·0	15·6	S.W.	N.	2	0·0	
19	·256	53·8	31·1	42·0	93·8	23·1	N.	N.W.	38	6·0	
20	30·138	61·0	40·0	50·1	107·7	28·6	S.W.	S.W.	153	5·5	·06
21	29·836	56·4	47·7	52·5	60·5	43·3	S.	S.W.	223	10·0	·18
22	·806	57·9	47·2	51·8	77·0	41·6	S.W.	S.W.	192	7·0	·28
23	·532	54·8	41·8	56·8	65·9	30·4	S.	S.W.	126	6·5	·23
24	·521	53·8	34·5	54·5	101·7	26·7	S.W.	E.	170	3·0	·18
25	·350	51·9	45·2	49·1	58·5	37·7	E.	W.	72	10·0	·22
26	·883	58·5	40·1	44·1	97·3	29·9	W.	W.	72	2·0	·02
27	29·891	55·7	41·0	48·9	94·9	29·6	S.W.	W.	150	4·3	·14
28	30·094	57·7	43·8	49·0	101·7	32·4	W.	W.	117	9·5	·22
29	29·716	58·0	46·2	52·6	58·0	35·6	S.	W.	270	10·0	·51
30	29·772	59·0	47·2	52·9	81·0	35·8	S.W.	S.W.	227	9·7	·03
31	30·254	56·7	45·1	49·4	102·9	35·9	W.	W.	754	0·1	
Mns.	30·045	57·6	39·2	48·3	94·4	31·0	...	...	Sum 5017	4·7	Sum 2·49

NOVEMBER, 1877.

Day of Month.	Mean Readg of Barometr. reduced to Sea Level.	Temperature. In the shade. Highest.	Lowest.	Adopted Mean.	Highst. in sun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean Amt. of Cloud (0-10).	Rain.
	in.	°	°	°	°	°					in.
1	30·438	57·4	40·1	46·1	101·2	29·0	W.	W.	98	1·5	
2	·081	54·0	35·6	45·5	105·9	25·2	W.	W.	78	10·0	·02
3	30·115	55·1	36·7	43·2	99·5	27·6	W.	N.W.	85	1·3	
4	29·820	53·9	36.0	46·2	100·5	27·9	S.	W.	133	9·5	·06
5	·823	57·0	44·2	49·9	98·7	36·3	S.W.	S.W.	148	1·3	·18
6	·638	57·2	48·4	54·2	64·6	42·2	S.W.	S.W.	268	10·0	·36
7	·683	56·0	46·0	49·7	86·4	32·0	S.W.	S.W.	633	5·0	
8	·852	55·6	37·3	45·6	99·7	27·8	S.W.	S.W.	90	0·0	·29
9	·517	55·4	46·7	51·4	66·9	40·5	S.W.	S.W.	459	5·5	·50
10	29·881	52·4	44·3	48·0	82·2	37·6	S.W.	S.W.	550	4·0	·44
11	28·960	52·0	43·7	48·8	52·0	36·9	S.	S.	341	10·0	1·65
12	28·978	51·8	40·6	43 9	91·1	33·4	S.W.	S.E.	185	6·0	·11
13	29·538	53·5	36·4	42·4	89·2	28·2	S.W.	S.W.	40	7·0	
14	30·143	50 7	31·3	40·1	(81·0)	20·4	W.	S.	159	5·5	·14
15	·255	55·7	45·7	51·9	64·0	39·2	S.	W.	86	10·0	·06
16	·377	55·3	36·4	45·2	93·8	26·6	W.	W.	188	5·3	
17	·382	52·3	31·5	48·2	93·0	23·9	W.	W.	12	5·0	
18	30·133	51·5	33·2	41·0	89·3	22·9	W.	W.	76	4.7	·01
19	29·810	47·5	31·5	39·1	64·0	19·6	W.	W.	104	5·5	·06
20	·738	46·5	35·2	39·3	90·0	27·4	W.	W.	155	3·5	.04
21	·597	52·6	33·0	43·8	56·0	20·4	S.W.	S.W.	226	10·0	·43
22	·260	52·7	38·3	45·2	80·5	36·7	S.W.	W.	445	8·5	·21
23	·698	47·9	38·1	41·4	88·5	29·0	W.	W.	325	4·7	·08
24	·314	40·0	37·3	38·6	41·0	30·1	E.	N.E.	157	10·0	1·00
25	·921	44·7	32·5	36·0	78·8	22·9	W.	W.	168	0·5	
26	·718	45·8	31·2	39·4	56·8	22·3	S.	S.	79	9·7	·70
27	·268	49·6	41·3	44·8	58·7	33·2	S.W.	S.W.	142	5·0	·39
28	29·247	46·3	35 4	39·9	88·8	30 0	S.W.	S.W.	153	4·5	·23
29	28·901	46·6	38·4	41·3	83·8	29·9	S.W.	S.W.	189	5·0	·05
30	29·117	47·3	36 8	40·3	67·0	30·3	S.W.	S.W.	246	8·5	·01
Mns.	29·690	51·5	38·1	44·3	80·4	29·6	...	...	Sum 6028	5·9	Sum 7·02

DECEMBER, 1877.

Day of Month	Mean Readg of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10).	Rain.
	in.	°	°	°	°	°					in.
1	29·433	47·0	30·9	36·7	78·0	24.0	S.W.	N.W.	68	6·5	·01
2	30·099	45·4	34·5	39·7	76·3	24·3	N.W.	N.W.	110	10·0	·03
3	·191	44·6	38·3	42·1	48·3	30·9	N.	N.	90	10·0	·05
4	30·047	43·9	41·2	42·0	52·0	38·4	N.	N.W.	47	9·7	·03
5	29·952	44·0	39·7	41·0	52·5	30·7	N.W.	N.W.	138	10·0	·42
6	·553	51·9	39·8	46·2	62·2	34·1	S.	S.	215	5·0	·13
7	29 949	46·3	38·5	40·5	58·0	30·0	S.	W.	51	3·0	·06
8	30·240	48·0	33·3	40·0	83·9	24·3	W.	W.	94	1·5	
9	·145	47·0	37·4	41·8	73·8	25·7	W.	W.	198	6·0	
10	·006	42·4	36·3	38·1	52·6	31·1	W.	S.W.	217	10·0	
11	30·040	44·9	32 7	38·9	53·0	23·6	S.W.	W.	163	7·0	·28
12	29·881	50·4	36·4	42·3	79·1	28·7	W.	W.	139	0·5	·12
13	29·987	41·8	31·3	35·2	54·0	19·3	W.	S.W.	48	0·3	
14	30·365	44·8	30·3	34·4	79·1	17·5	S.W.	S.W.	152	9·3	·01
15	·472	43·7	27·3	37·1	48·8	16·1	W.	W.	160	9·5	·02
16	·414	47·1	39·8	43·1	58·0	30·2	W.	W.	130	9·5	
17	·428	46·2	36·1	41·8	50·4	26·6	W.	W.	33	6·0	
18	·598	45·8	32·9	36·5	75·1	23·2	W.	W.	12	1·5	
19	·649	40·9	28·3	35·2	46 2	18·4	W.	W.	23	10·0	·03
20	·658	42·2	36·2	38·9	46·0	29·9	N.W.	W.	84	10·0	
21	·520	46·6	39·9	43·1	56 0	37·1	S.W.	W.	244	10·0	
22	·209	48·4	43·3	45·7	54·0	40·8	N.	W.	146	7·5	·07
23	30·183	48·9	33·0	38·7	82·0	23·9	W.	W.	195	7.0	·03
24	29·861	44·8	31·9	37·7	65 3	22·2	S.W.	W.	97	2·5	·03
25	·688	39·7	28·3	32·9	74·0	18·3	W.	W.	51	2·5	·05
26	·453	38·7	26·7	33·0	77·4	19·6	W.	W.	142	3·0	
27	·757	36·9	29·5	32·5	57·0	21 6	S.W.	W.	117	5·0	
28	·965	36·5	27·0	32·0	44·8	15·2	W.	S.	144	9·5	·53
29	·692	51·7	35·6	45·7	73·0	31·6	S.W.	S.W.	169	9·0	·07
30	29·619	50·3	44·3	47·5	55·7	36·1	S.W.	W.	231	10·0	·42
31	30·254	48·0	32·8	37·6	81·3	20 6	W.	S.W.	79	0·0	
Mns	30·074	45·1	34·6	39·3	62·8	26·3	...	...	Sum 3787	6·5	Sum 2·39

1877.

SUMMARY.

Month.	Mean Reading of the Barometer (reduced to Sea Level.)	Temperature. In the Shade. Highest.	Lowest.	Mean of all the Highest.	Mean of all the Lowest.	Adopted Mean.	Dew Point.	Mean of all the Highest in the Sun's rays.	Mean of all the Lowest on the Grass.	Degree of Humidity (Saturation=100).	Wind. Direction. Proportion of N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Velocity.	Amount of Cloud.	Rain. No. of Days it fell.	Amount Collected.
	ins.	°	°	°	°	°	°	°	°										Miles.			ins.
January	29 845	53·3	28·8	47·9	36·5	42·0	38·9	66·0	33·6	91	2	1	1	0	9	6	9	3	7417	6·9	28	5·65
February ...	·977	56·2	24·7	48·6	38·4	42·8	39·2	78·3	34·9	92	0	0	0	0	1	7	12	8	7350	7·2	19	1·61
March	·789	57 8	20·8	47 9	33·6	40·2	35·5	87·5	29·1	87	4	2	0	2	3	3	12	5	4467	6·3	19	2·41
April	·770	59·5	30·2	52·2	38·7	44·9	40·1	92·3	35·0	86	5	2	9	2	5	1	6	0	7105	7·9	19	3·67
May	29·893	64·5	25·8	56·8	39·9	48·2	40·9	105·3	34·2	78	10	1	4	1	3	4	7	1	4074	6·7	14	2·59
June	30·027	81·8	40·7	70·5	50·4	60 2	51·0	120 3	45·7	74	3	2	5	1	4	8	3	4	4914	5·2	8	1·12
July.....	29·939	82·5	41·4	67·9	50·4	58·9	53·3	118 6	44·6	84	1	0	0	1	1	10	15	3	4082	7·0	20	5·03
August	29·883	77·3	36 2	68·3	52·4	59·8	54·2	117 7	47·3	85	4	1	1	1	4	10	8	2	4008	6·4	17	4·81
September ...	30 091	66 5	33·1	61·1	43·8	52·0	46 8	105·7	37·5	85	10	5	3	0	1	5	2	4	3409	6·0	6	2·95
October	30·046	66·1	24 5	57·6	39·2	48·3	43·3	94·4	31·0	88	5	4	2	0	2	12	5	1	5017	4·7	15	2·49
November ...	29·690	57·4	31·2	51·5	38·1	44·3	41·1	80·4	29·6	94	0	1	0	1	3	13	12	0	7038	5·9	23	7·02
December ...	30·074	51·9	26·7	45·1	34·6	39·3	36·9	62·8	26·3	95	2	0	0	0	2	7	17	3	3787	6 5	19	2·39
Year	29 919	82·5	20·8	56·3	41·3	48·4	43·4	94·1	35·7	86·8	46	19	25	9	38	86	108	34	62698	6·4	207	41·74

SUMMARY OF THE WEATHER FOR 1877.

JANUARY.

"A January spring is worth naething."

The mild weather which was prevalent at the end of December, continued, with a slight exception from the 10th to the 13th, throughout this month; the mean temperature for the first 9 days being as high as 45°5. The maxima exceeded 50° on 10 occasions, while the minima only 5 times descended below 32°. The highest temperature during the month was 53°3 on the 19th, the lowest 28°8 on the 12th, and the mean 42°0.

Atmospheric pressure was subject to much fluctuation, and consequently brought wet and stormy weather. The lowest reading of the barometer was 28·712 in. at 9 a.m. on the 1st, the highest 30·653 in. at 9 p.m. on the 21st (a difference of nearly 2 inches), and the mean 29·845 in. Rain fell every day except on the 11th, 12th, and 22nd, the amount being 5·65 in. Fog occurred on 6 occasions, and lunar halos were seen on the 24th and 27th.

FEBRUARY.

"Who doffs his coat on winter's day,
Will gladly put it on in May."

The mild weather of the previous month continued during February, the last 3 days only being cold. The mean temperature from the 1st to the 19th was about 45°, the minimum during that interval not being lower than 32°8; the mean from the 26th to March 1st was, however, only 33°6. The highest temperature during the month was 56°2 on the 7th, the lowest 24°7 on the 28th; and the mean 42°8.

Atmospheric pressure was much more settled than last month, and from the 1st to the 9th was above 30 inches. The highest was 30·399 in. at 9 p m. on the 28th, the lowest 29·260 in. at 9 a.m. on the 26th, and the mean 29·977 in. Rain fell on 19 days to the amount of 1·61 in. Fog occurred on the 8th and 9th; snow fell on the 22nd, 26th, and 27th; hail on the 19th and 20th; and a lunar halo was seen on the 24th.

MARCH.

"March many weathers."

This month consisted of short periods of alternate cold and mild weather; the temperature on the whole was below the average, the mean 40°2, the maximum 57°8 on the 30th, and the minimum 20°8 on the 1st. Frost on the grass occurred on 20 occasions.

Atmospheric pressure was rather low, especially during the latter part of the month; the mean was 29·789 in., the highest 30·420 in. on the 1st at 9 a.m., and the lowest 28·870 in. on the 25th, at 9 a.m. Rain fell on 19 days, and the amount measured was 2·41 in. Fog occurred on 4 days, and thunderstorms on 2, viz., 26th and 29th. Snow fell on the 7th, 9th, 10th and 16th, and hail on the 7th and 18th.

APRIL.

"Cloudy April, dewy May."

This was a very dull and cloudy month. The first half was mild and damp, and the latter half cool, with a prevalence of E. winds. The mean temperature from the 1st to the 15th was 46°2, and from the 16th to the 30th, 43°0. The highest temperature was 59°5 on the 22nd, the lowest 30°2 on the 17th, and the mean 44°9.

Atmospheric pressure was low, the mean being only 29·770 in.; the highest reading 30·267 in. occurred at 9 a.m. on the 20th, and the lowest 29·113 in. at 9 p.m. on the 4th. Rain fell on 19 days, the amount being 3·67 in.; on 3 occasions more than half an inch was measured. Hail fell on the 6th and 17th, and a lunar halo was observed on the 16th.

MAY.

"May; come she early or come she late,
She'll make the cow to quake."

This month was very cold,—the first week being especially so. Severe frosts occurred on the 4th, 5th and 6th, when the minimum temperatures were respectively 27°7, 25°8 and 28°5. The lowest temperatures in May during the last 12 years have been as follows:—

1865.	33°2	1869.	29°1	1873.	26°7
1866.	25·7	1870.	26·0	1874.	26·4
1867.	25·5	1871.	31·1	1875.	38·0
1868.	32·3	1872.	29·2	1876.	29·8

Intense frost occurred on the grass from the 1st to the 8th; on the 4th and 5th the minimum thermometer registered 18°5 and 17°4. The mean temperature for the first six days was as low as 40°6, and the mean for the

month was only 48°2; the highest 64°5 occurred on the 26th, and the lowest 25°8 on the 5th.

Atmospheric pressure continued low, but was not subject to any great fluctuations. The mean was 29·893 in.; the highest 30·422 in. occurred at 9 p.m. on the 1st, and the lowest 29·240 in. at 9 a.m. on the 28th. Rain fell on 14 days, the amount measured being 2·59 in. A solar halo was seen on the 27th.

JUNE.

"Calm weather in June
Sets corn in tune."

This was the warmest month of the year. The mean temperature was 60°2, which is 12° higher than that for May, and more than 4° above the average of the past 12 years. The following are the mean temperatures for June from 1865 to 1876:—

1865.	58°5	1869.	52°7	1873.	55°3
1866.	57·9	1870.	57·6	1874.	54·3
1867.	54·9	1871.	52·2	1875.	57·6
1868.	57·0	1872.	54·8	1876.	57·9

The highest temperature 81°8 occurred on the 18th, and the lowest 40°7 on the 24th.

Atmospheric pressure was rather steady and above the average, the mean being 30·027 in.; the highest 30·276 in. occurred at 9 a.m. on the 28th, and the lowest 29·285 in. at 9 a.m. on the 1st. Rain fell only on 8 days, the amount being 1·12, half of which was measured on the 1st. Thunderstorms occurred on the 1st and 12th.

JULY.

"No tempest, good July,
Lest the corn look ruely."

With the exception of the last 3 days, this month was cold, the mean temperature being above 60° on 5 days only and then not exceeding 61°2. The mean for the last 3 days was 66°5. The highest temperature was 82°5 on the 31st, the lowest 41°4 on the 7th, and the mean 58°9.

Atmospheric pressure was slightly below the average, the mean being 29·939, the highest was 30·341 at 9 a.m. on the 9th, and the lowest 29 215 at 9 p.m. on the 14th. Heavy rain occurred on the 14th and 23rd, the amounts being 1·95 in. and 1·05 in. respectively; the total fall for the month was 5·03 in., with 20 rainy days. Thunderstorms occurred on the 6th and 7th, and Fog on the 30th and 31st. A lunar halo was seen on the 20th.

AUGUST.

"August ripens, September gathers in."

This Month with the exception of from the 13th to the 20th was cool, but not quite so cold as the preceding month, the mean 59°8 being almost 1° warmer than that for July. The maximum temperature exceeded 70° on 9 occasions only, while the minimum was as many times below 50°. The lowest temperature was 36°2 on the 24th, when a frost occurred on the grass. The minimum temperatures for the last 12 years are:—

1865.....40°2	1869.....32°4	1873.....44°3
1866.....38·7	1870.....35·2	1874.....38·9
1867.....40·1	1871..... ..40·4	1875.....41·2
1868.....40·3	1872.....39·1	1876.....39·8

The highest temperature recorded in the month was 77°3 on the 23rd. Atmospheric pressure was low and somewhat unsteady; the mean was 29·885 in., the highest 30·201 in. at 9 a.m. on the 24th, and the lowest 29·397 at 9 p.m. on the 8th. The rainfall 4·81 in. was about two inches above the average and exceeded that of any August from 1865 to 1876. The number of rainy days was 17.

SEPTEMBER.

"And cold out of the north."

This month was excessively cold, being nearly 8° lower than that of August, and considerably below the average. From the 21st to the 25th, the weather was exceptionally cold, the mean for these 5 days being as low as 46°7. The following figures may be interesting and will show the coldness of this month as compared with the Septembers of the past 12 years.

Year	Maximum.	Minimum.	Mean. Maximum.	Mean. Minimum.	Mean.
1865	82°5	35°2	78°4	49°3	60°5
1866	65·8	37·1	60·9	48·9	53·9
1867	76·7	32·4	64·0	48·2	55·4
1868	85·5	38·8	67·3	47·6	56·7
1869	73·2	31·9	64·4	48.9	55·8
1870	70.0	31·1	65·4	43·0	53·6
1871	78·0	34·0	62·6	47·8	54·4
1872	76·6	30·2	63·6	47·8	54·7
1873	70·8	36·5	61·4	45·8	52 6
1874	74·2	39·2	63·4	49·0	55·4
1875	78·0	41·2	68·2	50 8	58·8
1876	71·5	40·8	63·8	48·7	55·6
1877	66·5	33·1	61·1	43·8	52·0

Atmospheric pressure was high and not subject to much variation; the highest was 30·419 in. at 9 a.m. on the 27th, the lowest 29·738 in at 9 a.m. on the 3rd, and the mean 30·094 in. The rainfall was 2·95 of which 0·51 was measured on the 2nd, 1·23 on the 3rd, and 0·87 in. on the 11th. The month was dry, there being only 6 rainy days. The general direction of the wind was from the North. Fog occurred on the 27th to the 30th.

OCTOBER.

"The dews of the evening industriously shun,
They're the tears of the sky for the loss of the sun."

The cold weather of September continued during the early part of this month; from the 20th to the 31st the weather was much milder. The highest temperature 66°1 occurred during the gale on the evening of the 14th; the mean for the month was 48°3, and the lowest 24°5 on the 18th. The nights were for the most part clear, and consequently radiation from the earth was great, the mean minimum temperature on the grass being 8°2 lower than in the air.

Atmospheric pressure was above the average, the mean being 30·045; the highest was 30·688 in. at 9 a.m. on the 6th, and the lowest 29·266 in. at 9 a.m. on the 25th. The first part of the month was dry, but rain fell every day from the 20th to the 30th, the total number of rainy days was 15, and the rainfall 2·49 in. Fog occurred on 8 days and hail on 1; lightning was seen on the 16th, a solar halo on the 6th, and a lunar rainbow on the 24th.

NOVEMBER.

"Untimely storms make men expect a dearth."

The milder weather which set in at the latter end of October continued throughout the greater part of this month. The mean temperature was 44°3; the highest 57°4 occurred on the 1st and the lowest 31°2 on the 26th.

This was for the most part a dull wet and stormy month. The gale on the 11th was most severe, the reading of the barometer—28·664 in. at 9 p.m.—exceptionally low, and the rainfall 1·65 in. excessive. The rainfall for the month 7·02 in. was very great and nearly 4 inches above the average of the past 13 years. The following is the rainfall in November from 1864:—

	in.		in.		in.
1864.	3·15	1869.	2·57	1874.	3·52
1865.	3·82	1870.	2·04	1875.	4·33
1866.	3·04	1871.	0·69	1876.	4·34
1867.	1·48	1872.	5·23	1877.	7·04
1868.	1·65	1873.	3·29		

Atmospheric pressure was very unsettled and much below the average, the mean being only 29·690.

Rain fell on 23 days and hail on 1. Fog occurred on 6 days, thunder on 1, and lightning on 3. Lunar halos were seen on the 14th, 17th and 23rd, and lunar rainbows on the 14th and 22nd.

DECEMBER.

"The Ivy and Holy Berries are seen,
And Yule Log and Wassail come round again."

This month was mild, the only cold weather being from the 25th to the 28th, when the mean temperature was 32°6. The highest temperature during the month was 51°9 on the 6th, the lowest 26°7 on the 26th, and the mean 39°3.

Atmospheric pressure was high, that from the 14th to the 21st being especially so; the mean for the month was 30·074 in., the highest 30·695 in. at 9 a m. on the 20th and the lowest 29·273 at 9 a m. on the 1st. Rain fell on 19 days amounting to 2·39. Fog occurred on 7 days and snow on 3.

TABLE SHOWING THE MONTHLY AND YEARLY RAINFALL AT MARLBOROUGH—1864 TO 1877.

Years.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
1864	—	—	3·27	1·92	1·54	1·63	0·65	0·52	2·46	1·95	3·15	2·14	—
1865	3·80	2·27	1·16	0·97	2·55	2·79	2·51	3·90	0·28	7·25	3·82	2·39	33·69
1866	4·32	3·79	2·26	2·32	1·87	3·17	1·55	2·97	6·97	1·74	3·04	3·24	37·24
1867	4·02	2·48	3·77	2·79	2·39	1·66	3·99	2·53	2·28	3·48	1·48	1·58	32·45
1868	5·34	2·21	1·84	2·61	1·52	0·46	0·98	4·78	5·05	2·74	1·65	5·71	34·89
1869	3·77	2·52	1·53	1·54	4·03	1·23	0·75	1·55	5·72	2·01	2·57	3·69	30·91
1870	1·89	2·44	2·10	0·55	2·14	0·36	1·75	1·91	1·29	4·56	2 04	2·51	23·54
1871	2·93	1·51	1·63	3·85	1·00	2·99	3·63	1·18	6·22	1·88	0·69	2·49	30·00
1872	6·84	2·64	2·40	2·01	2·32	3·41	2·64	2·33	1·09	5·66	5·23	5·52	42·09
1873	4·13	1·53	2·62	1·26	1·89	1·62	2·15	2 70	2·96	2·68	3·29	0·88	27·71
1874	3·17	2·67	0·97	1·78	0·68	1·25	1·47	2·57	4·65	4·64	3·52	2·78	30·15
1875	4·53	2·13	1·33	1·64	2·51	2·78	5·60	2·12	3·78	7·64	4·33	1·31	39·70
1876	2·51	3·11	4·20	3·41	0·98	1·98	0·88	4·75	6·88	1·67	4·34	7·20	41·91
1877	5·65	1·61	2·41	3·67	2·59	1·12	5·03	4·81	2·95	2·49	7·02	2·39	41·74
Means 13 years.	4·07	2·38	2·17	2·19	2·04	1·91	2·53	2·93	3·85	3·72	3·31	3·21	34·31

TABLE SHOWING THE NUMBER OF DAYS OF RAIN AT MARLBOROUGH, 1864 TO 1877.

Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Augt.	Sep.	Oct.	Nov.	Dec.	Totals.
1864	—	—	16	12	12	18	8	11	26	13	18	12	—
1865	18	18	11	9	18	5	14	17	2	22	19	13	166
1866	23	22	15	18	10	16	12	20	26	16	16	20	214
1867	17	21	21	21	12	12	18	11	15	24	7	10	189
1868	14	12	18	13	8	3	4	15	12	16	13	27	155
1869	15	19	15	12	18	9	9	11	19	13	19	22	181
1870	14	12	14	2	9	4	10	10	10	19	11	13	128
1871	18	15	10	16	6	15	20	7	14	18	9	15	163
1872	27	22	14	13	18	17	10	15	16	21	22	25	220
1873	22	12	20	13	14	11	16	17	15	16	17	9	182
1874	17	17	13	12	11	9	11	15	16	21	19	14	175
1875	23	13	8	11	13	18	13	13	17	17	18	16	180
1876	11	20	20	19	6	9	8	12	24	14	17	22	182
1877	28	19	19	19	14	8	20	17	6	15	23	19	207
Means 13 years.	19	17	15	14	12	10	13	14	15	18	16	17	180

TABLE SHOWING THE GREATEST FALL OF RAIN WITH THE DATE IN EACH MONTH AT MARLBOROUGH, 1864 TO 1877.

Years.	Jan.		Feb.		March.		April.		May.		June.		July.		August.		Sept.		Oct.		Nov.		Dec.	
	Max.	Date.	Max.	Date.	Max.	Date.	Max.	Date.	Max.	Date.	Max.	Date.	Max.	Date.	Max.	Date.	Max.	Date.	Max.	Date.	Max.	Date.	Max.	Date.
1864.....	—	—	—	—	96	6	·60	17	·54	5	·39	10	·25	3	·21	9	·55	16	·69	21	·66	24	·79	8
1865.....	·67	26	·56	16	·47	4	·31	18	·53	8	·83	29	·49	31	·87	23	·17	20	1·66	16	1·18	19	·56	28
1866.....	·62	10	·62	11	·54	23	·60	28	·73	26	·83	30	·49	2	·79	29	·90	1	·42	24	·86	13	·68	5
1867.....	·70	7	·38	5	·68	13	·54	14	·67	20	·35	2	·71	16	·56	15	·93	2	·57	9	1·07	30	72	1
1868.....	·99	21	·82	29	·46	7	·84	19	·35	19	·33	21	·36	12	1·18	17	1·03	29	·60	28	·47	21	·52	7
1869.....	·76	28	·64	11	·48	19	·38	14	1·15	18	·34	13	·28	28	·41	2	·88	30	·63	1	1·14	27	·84	16
1870.....	·28	11	·91	6	·65	1	·36	9	·77	11	·23	16	·85	31	·61	27	·36	8	·71	22	·56	24	·73	18
1871.....	·72	15	·28	9	·47	9	1·01	18	·49	27	·98	17	1·24	10	·35	17	1·30	29	·36	17	·39	14	·56	19
1872.....	·92	23	·39	22	·67	28	·49	27	·36	13	·53	6	1·15	25	·67	7	·27	1	1·06	24	·57	4	1·11	16
1873.....	1·10	17	·45	23	·73	15	·28	16	·41	3	·51	28	·83	12	·37	28	·63	1	·59	12	·94	1	·28	31
1874.....	·55	18	·88	25	·10	18, 29	·52	8	·24	7	·29	23	·41	26	·36	11	·91	2	1·17	5	1·40	27	·76	7
1875.....	·56	1	·62	6	·57	6	·34	6	·58	28	·54	13	2·32	14	·97	12	·83	21	1·32	9	·79	13	·35	2
1876.....	1·51	21	·52	14	·58	11	·65	20	·63	22	·60	15	·31	31	·94	20	1·64	5	·47	6	·80	27	·91	7
1877.....	·84	6	·86	19	·37	23	·55	3	·47	12	·56	1	1·95	14	90	14	1·26	3	·51	29	1·65	11	·53	28

ACCOUNTS, 1877.

MIDSUMMMER.

RECEIPTS.	£	s.	d.	EXPENDITURE.	£	s.	d.
Balance	22	5	6	Field Days	14	10	0
Antiquities	2	9	0	Garden	3	4	6
Composition	2	2	0	Museum	18	10	9
Field Days	14	7	0	Report	60	7	9
Report	73	18	0	Sundries	0	14	2
Subscriptions—Members	10	8	0	Balance	31	12	4
„ Hon. Mems.	3	10	0				
	£128	19	6		£128	19	6

CHRISTMAS.

RECEIPTS.	£	s.	d.	EXPENDITURE.	£	s.	d.
Balance	31	12	4	Garden	6	2	0
Antiquities	0	19	0	Museum	9	3	0
Report	33	12	6	Report	30	6	10
Subscriptions—Members	4	4	0	Sundries	0	10	0
„ Hon. Mems.	3	19	6	Balance	28	5	6
	£74	7	4		£74	7	4

REPORT

OF THE

MARLBOROUGH COLLEGE

Natural History Society,

(FOUNDED APRIL 9th, 1864),

FOR THE

YEAR ENDING CHRISTMAS, 1878.

No. 27.

"Tum mihi Naturæ libeat perdiscere mores:
Quis Deus hanc mundi temperet arte domum."

MARLBOROUGH:
PRINTED BY PERKINS AND SON, "TIMES" OFFICE,
1879.

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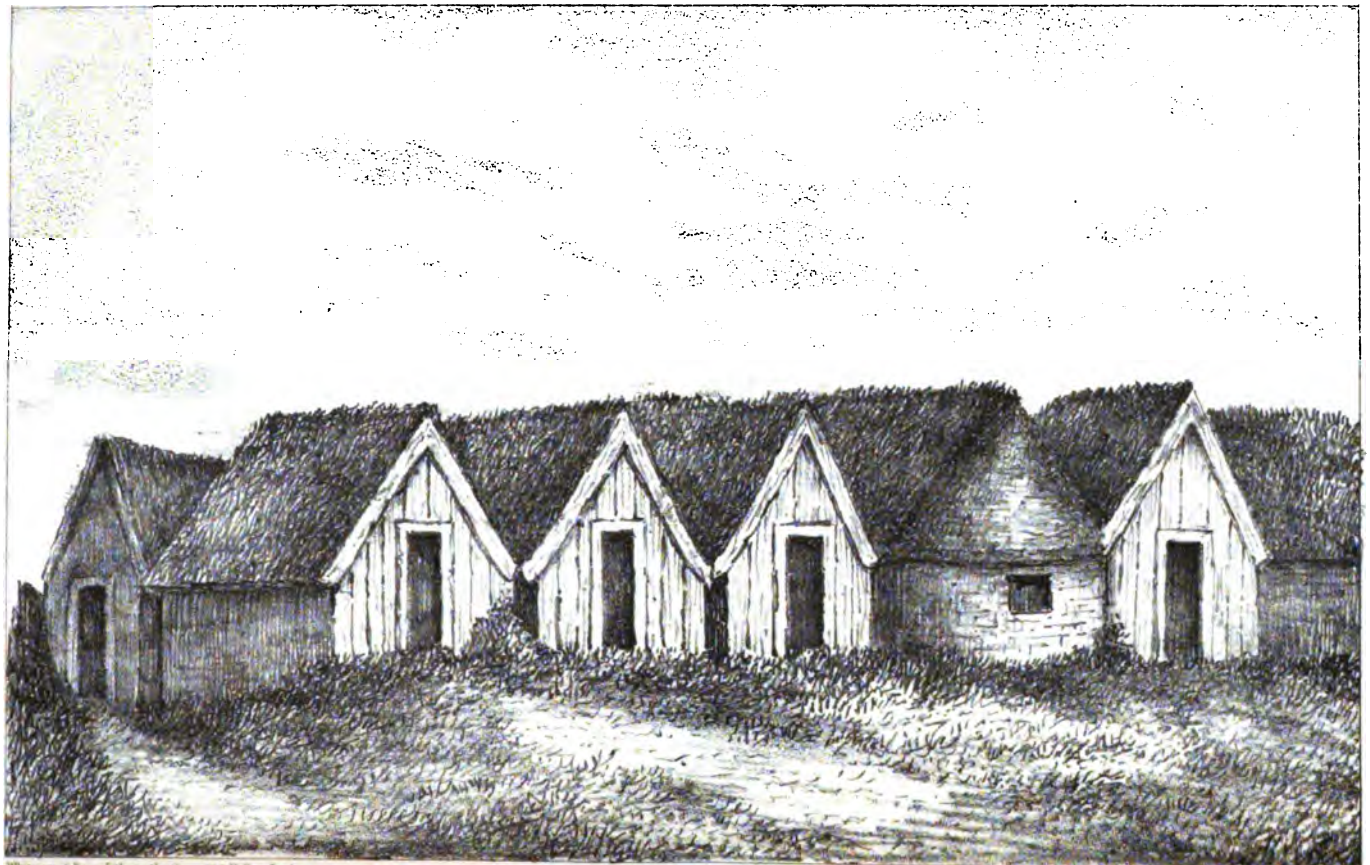

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ICELANDIC HOUSE

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1879.

PREFACE.

DURING the past year several changes have been made in the working of the Society, some of which have already produced their results. The limitation of the numbers of the Society to 40, and the restrictions in connection with the Museum have had the best effects; it is no longer possible to join merely for the sake of the Field-days or Museum, and the fact that still the full number is kept up points to an increasing interest in Natural History work. This interest has been further stimulated by an experiment, which has met with decided success, namely, that of having small excursions about once a week, for which the best workers were selected; the amount of practical work was thus greatly increased, and there was very fair competition for a prize, offered last summer term for the first time, for the greatest number of notices. F. S. ALSTON, the winner of the prize, was especially energetic in more than one branch, and promises to bo an exceedingly useful member. Besides this marked improvement in practical work, the attendance at meetings has been very satisfactory, both in the Summer and Christmas terms.

Another change has taken place, the result of which cannot be seen yet; it has been thought advisable to bring out one Report in the year, instead of two, the year's work being thus exhibited at one glance, and the variety of papers being greater than according to the old system. In the present number several useful and interesting papers have been contributed by

Masters, with their usual kindness, and members of the School are better represented than is often the case.

The present year has also seen another Conversazione, this time in combination with our sister Institution, the Art Society, the Bradleian falling to our share, and the Adderley to F. E. HULME, Esq., and his coadjutors. There was a large assemblage of Visitors from the neighbourhood, in addition to a goodly number of representatives of the School: a full account of it is given elsewhere; but the Committee here wish to express their thanks to all those, Masters and boys, whose exertions so greatly conduced to the success of the evening.

The Museum has been enriched by further additions, the most important being, a collection of Indian Birds, presented by H. C. SPRY, Esq., O.M.; one of Burmese Butterflies, by H. I. ROACH, Esq., O.M.; and some magnificent specimens of basalt from the Giant's Causeway, by Capt. ATKINS, R.N. Towards the cost of mounting the eagles included in the first of these, the Council have generously contributed £10; other Donations are recorded in another place, and the Committee here beg to return thanks to the Donors.

LIST OF MEMBERS.

President:

Rev. T. A. Preston.

Secretary:

Lent and Summer Terms.	*Winter Term.*
W. M. H. Milner.	W. H. Chappel.
	O. Elton.

Treasurer:

Rev. C. E. Thorpe.

Committee:

Lent and Summer Terms.

The Ex.-Officio Members.	F. E. Thompson, Esq.
G. F. Rodwell, Esq.	J. H. C. Dalton.
	W. H. Worship.

Winter Term

Ex.-Officio Members.	T. O. Harding, Esq.
G. F. Rodwell, Esq.	W. H. Worship.
	O. Elton.

Honorary Members:

F. E. Thompson, Esq.	Rev. J. W. Mills.	H. J. Verrall, Esq.
W. E. Mullins, Esq.	W. W. Fowler, Esq.	E. Meyrick, Esq.
Rev. J. Sowerby.	C. Sankey, Esq.	C. W. Bourne, Esq.
Rev. G. G. Bradley, D.D.	A. H. Beesly, Esq.	H. D. Drury, Esq.
C. M. Bull, Esq.	F. E. Hulme, Esq., F.L.S., F.S.A.	Rev. C. Soames.
W. Fergus, Esq., M.D.		H. P. Dixon, Esq.
S. B. Dixon, Esq., F.G.S.	Rev. C. E. Thorpe.	W. A. Clarke, Esq.
W. H. Macdonald, Esq.	Rev. J. S. Thomas.	Rev. W. M. Furneaux.
J. F. Duthie, Esq.	Rev. F. W. Farrar, D.D., F.R.S.	Rev. A. C. Smith.
G. H. Dawson, Esq.		J. B. Fuller, Esq.
Rev. A. C. Almack.	W. P. Sellick, Esq.	A. E. Garrod, Esq.
E. F. im Thurn, Esq.	H. C. Spry, Esq.	T. O. Harding, Esq.
G. K. Mills, Esq.	G. F. Rodwell, Esq.	Rev. G. C. Bell.
W. Mansell, Esq.	W. D. Fenning, Esq.	W. W. Goodchild, Esq.
Rev. G. W. DeLisle.	R. E. Price, Esq.	L. E. Upcott, Esq.
H. A. Evans, Esq.	Capt. R. B. Reed.	W. M. H. Milner, Esq.

Members:

LENT TERM, 1878.

W. M. H. Milner
J. H. C. Dalton
E. G. Waddilove
R. B. Dods
A. E. Aldworth
C. B. Stewart
H. D. Rolleston
J. U. Coates
W. H. Chappel
F. S. Alston
H. R. Hordern
W. H. M. D'Urban
E. M. R. Cox
G. C. Alston
O. Elton
S. R. Baker
C. E. Pine-Coffin
R. B. Thompson
A. L. Wright
F. S. Robinson
A. H. Davis
E. C. Vincent
E. T. Sankey
D. M. Wauchope
D. A. Hailes
A. Meyrick-Jones
G. B. Routledge
J. P. Clarke
S. Grant-Dalton
L. C. R. Thring
C. M. Stephenson
D. B. Thomson
E. S. Paine
W. J. Hemsley
S. Duncan
G. A. H. C. Berkeley
T. D. Harrison
P. Caldecott
E. R. Chambers
A. V. Baillie
P. F. Dickinson

MIDSUMMER TERM, 1878.

W. M. H. Milner
J. H. C. Dalton
E. G. Waddilove
R. B. Dods
A. E. Aldworth
C. B. Stewart
H. D. Rolleston
J. U. Coates
W. H. Chappel
F. S. Alston
W. H. M. D'Urban
E. M. R. Cox
G. C. Alston
O. Elton
S. R. Baker
C. E. Pine Coffin
R. B. Thompson
E. C. Vincent
E. T. Sankey
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A. Meyrick-Jones
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J. P. Clarke
S. Grant-Dalton
L. C. R. Thring
C. M. Stephenson
D. B. Thomson
G. A. H. C. Berkeley
T. D. Harrison
E. R. Chambers
P. F. Dickinson
T. G. Balfour
S. A. Pearse
S. B. Wilson
P. A. Sheppard
E. R. Blackburne
G. F. V. Rogers
O. G. Kennedy
H. J. Reiss
W. H. Worship
D. E. Olivier
H. P. Highton

CHRISTMAS TERM, 1878.

J. H. C. Dalton
E. G. Waddilove
R. B. Dods
A. E. Aldworth
H. D. Rolleston
J. U. Coates
W. H. Chappel
F. S. Alston
O. Elton
S. R. Baker
C. E. Pine Coffin
E. C. Vincent
D. A. Hailes.
A. Meyrick Jones
G. B. Routledge
J. P. Clarke
L. C. R. Thring
G. A. H. C. Berkeley
T. D. Harrison
S. A. Pearse
S. B. Wilson
P. A Sheppard
E. R. Blackburne
G. F. V. Rogers
H. J. Reiss
W. H. Worship
H. P. Highton
G. H. Elin
P. A. Butler
G. S. Chittenden
R. de B. Hovell
A. E. Alderson
C. H. Hooper
R. A. Farrar
H. A. Hartley
C. E. Cooper
W. F. H. Blandford

EXTRACTS FROM THE RULES.

That this Society be called the Marlborough College Natural History Society.

Constitution.

That the Society consist of Members and Honorary Members.

Officers.

That the Officers of the Society consist of a President, Secretary, Treasurer, Librarian, and Curator.

Election of Officers.

That the President have the absolutepower of nominating the Secretary.

That those Members of the Committee, who are not ex-officio Members, be elected terminally, and that the retiring Members be eligible for re-election.

That the same rule apply to the Treasurer, Librarian, and Curator.

Management.

That the affairs of the Society be conducted by a Committee, consisting of the President, Secretary, Treasurer, and four other Members of the Society, two of whom, at least, shall be members of the School, to be elected from and by Members of the Society; three of whom shall form a quorum.

President.

That in case of an equality of votes, the President shall have a double or casting vote.

Secretary.

That the duty of the Secretary be to summon meetings (when necessary) of the Society; to keep a detailed report of the proceedings, as well as lists of Members and Visitors present at each meeting, and generally to act under the direction of the Committee in all matters connected with the welfare of the Society.

Librarian.

That the duties of the Librarian be to keep a Catalogue of the Library, with the names of the donors, and to see that the Library Regulations are carried into effect.

Curator.

That the Curator be responsible for the order of the Museum.

Library.

That any Member of the Society be at liberty to consult any of the books belonging to the Society, but that only certain volumes, to be decided on by the Committee, be allowed to be taken from the room.

Museum.

That members have access to the Museum whenever a responsible Person is present, but that only certain members be allowed access at all times when the Room is not used for school purposes. Application for this privilege must be made to the President.

Field Days.

That the Field Days be confined *entirely* to Members of the Society, and that the President appoint a day on which names must be given in.

Members.

That the election of new Members rest entirely with the Committee.

That every member pay a subscription of 2s. 6d, his first term, and 1s. every subsequent term.

That if a Member be elected after the commencement of the term, the amount of his subscription for that term shall be settled by the Committee.

That Members have the right to introduce two visitors at all general meetings of the Society.

That every member must be present at two meetings, at least, every Term.

Honorary Members.

That Honorary Members have all the privileges of Members except the power of introducing a Member of the School to the meetings of the Society.

That Honorary Members pay 5s. a half-year, for which they shall be entitled to a copy of the Report.

That Honorary Members may compound for all future subscriptions by the payment of a sum of two guineas.

Suspension of Members.

That any member be liable to be excluded from the Society by the Committee, if in their opinioin, he shall have failed to show sufficient energy in the working of the Society.

Sections.

That the Society consist of sections to be formed for the more accurate study of the different branches of Natural History, and that every Member must belong to a Section.

That the question of the number of Sections be left open for settlement at the beginning of each term.

New Rules.

That any member of the Society have power to propose any new rule or any alteration in an old one, provided the motion be seconded by another Member.

LENT TERM, 1878.

PRELIMINARY MEETING, JAN. 24TH, 1878.

The meeting was but poorly attended, only 15 members being present. The regular meetings were fixed for Feb. 7, 21, Mch. 7 and 28.

MEETING HELD FEB. 7TH, 1878.

S. R. Baker read a paper on Avebury.

The following donations were exhibited:—"British Barrows," presented by the Author, Prof. Rolleston, F.R.S.

Transactions of the New Zealand Institute, vol. ix., by the Society.

Specimen of Rock from Sebastopol.

A collection of Chinese Plants by C. W. Everard, Esq, O.M. These, about 100 in number, were of great value, some being new to science and many interesting from having been found in a new locality, or fixing the localities for specimens in the national Herbarium at Kew, which had not been localised.

The following extracts from letters received from L. Moore, Esq., F.L.S, of the Kew Herbarium, who kindly named the species, will prove the value of these collections.

Ningpo is a most interesting place for a Botanist, as scarcely anybody with a love for plants has collected there. There are at least three new species, and possibly three or four more. The certainly new ones are (i) the *Thalictrum*, which is near to, but distinct from, *T. orientale* Boiss, and of which we have had an hitherto undescribed specimen for many years in the Herbarium here, the said specimen having been gathered by Fortune the Traveller; (ii) the *Nepeta*, a very distinct thing, which I propose to call *N. Everardi*; and (iii) the pretty little *Pinguicula*-like *Gymnadenia*. The *Mucuna*, &c., are possibly new, but there is not sufficient material for determination. Many of the things are interesting geographically, such as *Teucrium nepetæfolium* (represented by only a scrap here), *Burgea Sheareri* and *Tulipa graminifolia*, known only from Kiu Kiang, *i.e.*, much further inland; *Lamium Chinense*, hitherto not localised, and so on. As for the second collection, "though not containing any distinct novelty, there are several plants

of great interest now for the first time localised, owing to the labels of the original collector (Fortune) giving no information as to place of gathering: such are *Photinia pustulata, Ribes fasciculatum var chinense, Ilex cornuta, Siphonostegia* and *Litsæa polyantha.* Among the more valuable things may be named *Aconitum chinense,* only certain locality Kiu Kiang, *Orychophragmus sonchifolius,* a N. China plant, *Thermopsis chinensis, Rhododendron ovatum, Symplocos decora* var *angustifolia,* type only recently discovered at Hong Kong, *Lithospermum japonicum,* unless I am mistaken not hitherto found outside Japan, *Marrubium incisum,* a N. china species, the curious var (?) (an *sp. nov.*) of *Paulownia imperialis, Paris polyphylla,* and *Œcoclades falcata.* Among the Ferns Mr. Baker tells me there are several hitherto not known to occur out of Japan, and *Davallia Tyermanni* is of especial value, as it was described from a garden specimen supposed to have been derived from Tropical Africa. I said there was nothing new, but the statement ought to be qualified. The *Camellia,* which we retain, is, I think, a new species, but unfortunately there is not enough material to admit of a description; the above-mentioned *Paulownia* may also be new, as well as the *Scorsonera;* so that, all things considered, this collection may fairly be said to be as good as the other one."

The President also exhibited on behalf of W. S. M D'Urban, Esq., some Photographs of Palæolithic implements from the River Drift gravels in the Valley of the Axe. "These implements, made of a very dark brown *chert,* are found at Broom Ballast Pit, in the Parish of Hawkchurch, near Axminster, close to the River Axe, in the angle formed by the junction of a tributary brook with it. There is here a low hill, the base of which is on a level with the railway. It is composed of chert gravel derived from the green-sand which caps the higher hills surrounding the valley. This gravel has been excavated for ballast for the line, and during 1877, attention having been directed to the occurrence of implements in similar gravels elsewhere, a great number were found and brought to the Albert Memorial Museum, Exeter. They are remarkable for being made of chert, an unusual material. Their forms, however, are just those of the ordinary River Drift Implements of England, France, and Spain, and many are very like Cissbury flint Implements. The pit is about 50 feet in depth in the centre, and the implements are believed to occur at a depth of from 30 to 40 feet. Most are quite sharp but some have been much water-worn."

The President exhibited coins of Richard II and James II, and a gold crown of Charles I, which had been secured for the Society's collection.

There were 35 persons present. 2 hon. members, 18 members, and 15 visitors.

MEETING HELD FEB. 21ST, 1878.

The following donations were exhibited:—"The world of the Sea," presented by E. S. Paine. Portion of Fossil Tooth of Elephant by H. D. Rolleston. The President exhibited specimens of recent elephant's teeth, to show their mode of growth. He then read a paper on the Echinus.

There were 41 persons present. 4 hon. members, 20 members, and 17 visitors.

At a private meeting held afterwards, the following rule was passed:—

"There shall be, besides the ex-officio members, four members of the Committee, two at least of whom shall be members of the School."

In accordance with this rule W. H. Chappel was elected on the Committee.

The meeting fixed for March 7th was postponed to March 9th, when T. O. Harding, Esq., gave a Lecture on the Telephone. The lecture was delivered in the Upper School, and was very largely attended. A large number of the Common Room, and several visitors from the town were present, and the whole School was admitted.

THE TELEPHONE.

I do not intend to confine myself in what I have to say to the Telephone, but to endeavour to give you a general view of the problem of Sound. transmission and the various attempts which have been made to deal with it. And this will necessitate continual wandering from the point under consideration into matters connected with other sciences than Acoustics; but for these digressions, if I confine them within reasonable limits, I shall hope to receive your pardon.

Let us first consider the nature of Sound, and the manner of its transmission from place to place in nature. Sound is in all cases produced in the ear by the vibration of the particles of the air contained in the ear; which vibration has been imparted to them by their neighbours, which in their turn received it from their neighbours, and so on in turn till we reach some body which is maintained in a state of vibratory motion independently of the surrounding air, and which we call the sounding body. In nature, then, the mode of sound-transmission is simply the passing on of motion from a striking body to a neighbour which it strikes.

But it is obvious, as of course we know from experience, that transmission in this manner is only possible within certain distances. When any

portion of air is set in sound-vibration, it begins to strike the portions which surround it in every direction, and thus the energy of its motion, being diverted forwards, backwards, and sideways, is rapidly reduced, and so far reduced as to be insensible. This dissipation can be in great part avoided by so disposing the form of the body along which the sound is to be propagated as to make it much easier for the sound to advance along it than to escape sideways. This is the effect of a speaking tube: it is easier for the air set in motion at one end of the tube by the voice to cause the next portion to vibrate than to set the particles of the tube in motion; accordingly a great portion of the original disturbance arrives at the other end of the tube; and the voice is thus carried to points which it could not have reached without such means of transmission. Another application of the same principle is afforded by the toy-telephone. This consists simply of a cylindrical box open at one end and having the other closed by a stretched membrane such as paper, bladder, or parchment. Through a hole in the centre of this membrane passes a string, which is secured by a knot at its end. The other end is similarly attached to an exactly corresponding instrument, and the string is either stretched between the two so as to rest nowhere, or is supported by loops of thread a foot or two in length from fixed supports. If anyone speaks into one of these boxes, the string being kept fairly tight, the voice is plainly heard in the other at a distance of a few hundred feet. Here again it is easier for the sound vibrations set up in the parchment of one box to extend along the string than to go off sideways into the air, and the greatest effect is accordingly produced at the other end of the string. The string must nowhere touch a solid support, or much of the vibration will be lost.

But it is clear that this mechanical transmission of sound as vibration has limits, though we may in some cases considerably extend those limits. Do what we will, we cannot prevent, though we can make small, the loss of sound by lateral dissipation. If the sound is to be transmitted to great distances, some other method must be applied.

The agent to which we always have recourse now-a-days if action is to be propagated to a distance, is the electric current. And in order to produce a mechanical effect by its means, we almost invariably make use of an electro-magnet. This is the name given to a rod of ordinary soft iron (*i.e.*, not steel) on which a wire, coated with an insulating covering such as silk, is coiled as on a bobbin. As soon as a current of electricity is passed through the wire, the iron rod becomes a magnet, and powerfully attracts any other pieces of iron in the neighbourhood. When the current ceases, the rod becomes again an inert piece of iron. If therefore a moveable piece of iron is placed in the neighbourhood of such an electro-magnet, we can attract it to the magnet,

when the current is made to pass through the wire, and can again release it on cutting the current off. If the moveable piece is furnished with a spring which forces it back to its original position when the current ceases, we can at pleasure move the piece up to the magnet and let it fall back again, by alternately turning the current on and off, and this at any distance. This is the principle of all forms of the Electric Telegraph.

In order to see what this make-and-break arrangement will do for us, and what it will not do, in sound transmission, we must inquire a little more closely into the nature of sound-vibrations. Sounds differ in pitch, in loudness, and in quality. As to pitch they may be high or low, and this is known to depend on the quickness or slowness of the vibration causing them. The loudness of the sound depends on the distance traversed by the vibrating particles: if their excursion is great, the sound is loud: if they move only a comparatively short distance, the sound is weak. The quality of the sound, that by which we distinguish between a note of the voice and the same sound on a pianoforte, depends on the manner in which that vibration is executed: as for instance whether the vibration is accomplished in one sweep, or whether the vibrating particle pauses in the middle of its journey and then goes on again. Now if a vibrating body be made to interrupt and reform an electric circuit, the only characteristic of the sound which will be represented in the current is the pitch; the current will be made and broken at each vibration, and will set a properly arranged body in vibration with a period exactly corresponding to that of the original: but no trace will appear in the current or in the body excited by the current of the quality of the vibration of the sounding body.

Now Helmholtz has proved that all sounds are composed of simple musical notes, such as are given out by a tuning-fork. The nature of this proof I cannot now go into, but that diversities of vocal sounds may be imitated by a musical instrument, may easily be verified. Raise the dampers of a piano and sing a note before it: the strings will be set in vibration, and will continue the note after you. But now sing the same note to different vowels; the resonance of the piano will give you not merely the note but also the vowel you sang into it. This being the case, any sound whatever might be imitated by a sufficient number of properly arranged tuning-forks, each exalted to the proper degree of loudness and remaining in action for the proper time. Moreover if a sufficiently numerous series of forks were at hand, any sound made near them would excite those forks whose notes were present as its components, and would set them in vibration. Now it is easy to arrange a fork so that at each vibration it may make and break an electric current: if one prong is made to carry a wire which just does not touch the surface of mercury in a cup, at each vibration the point of the wire will be dip-

ped, and this momentary dip will complete the circuit. If then at any distance the current be wound round a pair of electro-magnets so placed as to attract the prongs of a similar fork, they will receive a momentary pull at the instant of making contact, and be instantly released again when the exciting fork raises the wire from the mercury trough and breaks the circuit. The same pull being continually repeated will soon set the distant fork into corresponding vibrations, and the sound of the first fork will thus be transmitted to a distance. Suppose now a system of such forks each similarly mounted. Any sound made near them would excite those forks whose notes compose it; these would excite their correspondents at any required distance, and the latter being thrown into vibration would completely reproduce the original sound.

And this is so far as we can see the only mode in which the make and break principle, or the principle of the discontinuous current, will help us. It is only in the case of the simple tone, as it is called (the tone, namely, which a fork gives out) that the frequency is the only thing we need know in order to know the sound completely. And as frequency is the only thing we can telegraph by making and breaking a current, it follows that the make and break method can only be used when the original sound has been resolved into simple tones.

If we abandon this method of resolution as too complex, we must have some method of feeling the pulse as it were of a vibration, not merely at the end of each excursion, but throughout the movement. And to do this we must arrange some method by which we can work not with a current which is continually broken off and remade, but with one whose strength is continually altering. The following facts will indicate how such alteration is actually brought about.

If we connect a galvanometer with the ends of a coil, and introduce a permanent magnet into the coil, the needle of the galvanometer is seen to be deflected, which proves that the mere entry of the magnet into the coil has produced a current in the wire. This current dies away at once; it only lasts while the magnet is being introduced; as soon as the magnet is at rest within the coil, the needle returns to its original position. Now if the power of the magnet is increased, the same effect is produced as if a new magnet were introduced; during the increase of power a current is produced in the wire, which again dies away as soon as the magnet has attained its new strength. Such increase of power in the magnet is occasioned by bringing a piece of soft iron near it. This will show itself by a deflection of the galvanometer needle; and thus without a battery we may move the galvanometer needle to one side or the other by simply moving a piece of iron to or from the magnet which stands in the coil.

Now this is precisely the action of the Telephone. A thin sheet of iron is placed close to the end of a magnet, around which a wire is coiled. The two ends of the wire are connected at any distance with the two ends of a coil in a similar instrument, and the arrangement is complete. If a sound is made near the first instrument, the sheet of iron is set in vibration, and alternately approaches and recedes from the end of the magnet. As it approaches it strengthens the magnet by induction, and this increase of strength produces a temporary current in the coil. This current passes through the other coil, makes the magnet enclosed in it an electro magnet, and thus adds to its strength, and the result is a pull on the sheet of iron in the receiving apparatus. When the sheet at the speaking end recedes from its magnet, the power of the latter is weakened; an opposite current is temporarily produced in the wire; this again takes off from the power of the magnet at the receiving end, and the sheet of iron there is let go. Thus the receiving sheet is compelled exactly to follow the motions of the sheet at the sending end, and gives out precisely the same sound as is uttered at the original place. It is not merely that a pull is given to the second sheet exactly as often as the first sheet vibrates, this would ensure only a sound of the same pitch: but throughout the whole vibration, the pull is so varying as to make the second sheet follow accurately the motion of the first, and the result is that not only in pitch but in quality the sound produced is the same as that uttered at the sending instrument, and therefore not only vowels but consonants also can be accurately reproduced.

MEETING HELD MARCH 28TH, 1878.

N. Masterman, Esq., read a paper on Falconry.

After the paper the trays of Chinese and Eskimo curiosities belonging to the Society were exhibited and described; also a specimen of Sponge, presented by C. Ll Davies, and an ammonite from Rockley by D. E. Olivier.

There were 34 persons present. 3 hon. members, 16 members, and 15 visitors.

MIDSUMMER TERM.

PRELIMINARY MEETING HELD MAY 10TH, 1878.

The President announced that the Committee had decided that the number of members should be limited to 40, and that a prize would be given by the Society for the greatest number of notices obtained during the term by any member of the School below the VI.

Meetings were fixed for May 16th, 30th, June 13th, 27th, and July 11th. The Field Day was to be held on June 1st, and the Conversasione on a day to be fixed hereafter.

It was also decided that a series of small weekly or fortnightly expedition should be held during the term.

MEETING HELD MAY 16TH, 1878.

The following donations were exhibited:—

Prof. Balfour Stewart's Elementary Physics, by the Author.

Cones of the Cedar of Lebanon; Capsule of the Sapucaia Nut; Part of the stem of the Lace Tree; Fine specimen of Amber Gum; Skull and foot of the Albatross; Elephant's Hair; Toe-nails of the Tapir; Boar's Tusk; Leopard's Teeth and Shark's Teeth, by A. Meyrick-Jones. Chuckrums and Chuckrum Board (chuckrums are the common coin of South Travancore, of which 28 go to the Rupee, and are generally counted by pouring them on a board with 100 holes fitted to receive them), and Betel Nuts (commonly used as a condiment all over India) by F. W. Bourdillon, Esq., O.M., Mynhall Estate, South Travancore.

A fine specimen of the Edible Nests of the Swiftlet, from a cave on the Eridge Estate, South Travancore, by T. F. Bourdillon, Esq., O.M.

Very fine Crystals of Salt, from the Sambur Salt Lake, 1000 miles from the sea, by J. A. Bourdillon, Esq., O.M.

A Lance from Waterloo, by Mr. John Neate.

Shell of the Roman Snail (*Helix Pomatia*), by H. D. Rolleston.

A further collection of antiquities dug up at Barbary Castle, by Rev. Henry Harris.

W. H. Chappel, O. Elton, and W. M. H. Milner gave their reports on the Ornithological, Entomological, and Botanical notices taken since the beginning of the term.

W. H. Chappel then read a paper on Cornish Superstitions.

The President made some remarks on a complete series of specimens, illustrating the different processes in the manufacture of Cotton, presented by J. H. C. Dalton.

There were 65 persons present. 2 hon. members, 30 members, and 33 visitors.

CORNISH SUPERSTITIONS.

"In Cornwall I was born and bred,
In Cornwall was my dwelling."

The subject on which I have been asked to read you a paper to-night is a large one, and one which, while it has an especial interest for Cornishmen like myself, does not seem to have much relation to the M.C.N.H.S. I must treat it very briefly and shall content myself with giving you one or two illustrations of the various kinds of superstitions which are, or have been, prevalent in Cornwall. Were I to confine myself to those superstitions which I have myself come across during my life in Cornwall, my paper would not take me more than a few minutes, for superstitious beliefs are fast dying out even there, where they have survived and influenced men's minds to a greater degree and a more recent date than perhaps in any other country. The casual observer might almost doubt the existence of superstition at all, at least to any large extent, but this seeming loss of it is I believe more apparent than real, and owing chiefly to a fear of ridicule; this may explain why I am unable to bring forward many examples of my own experience; still what I have are from good authority in spite of their being partly second hand. Superstition does exist to a large extent, as this I hope you will see for yourselves when I come to the end of my paper.

With this much explanation I will proceed to consider *why* the Cornish people should be particularly superstitious: like all Celts they are extremely Conservative in their notions and slow to receive innovations. Till quite a recent date they were almost entirely cut off from the rest of England by the Tamar; even now there are many remote districts only connected with civilization by the small market-vans, in which if you have once travelled I feel sure you will not try them again. But favoured as superstition was by this remoteness and inaccessibility, I believe we can find two chief causes for the growth of it; first, the religious character of the Celtic race: at first sight this would seem to do away with foolish ideas, but as it is with the individual so is it with the people. "The 'bogle' or 'bogie,' with which

the child is terrified into submission by some thoughtless nursemaid, remains a dim and unpleasant reality to shake the nerves of the philosopher." Things like these become a power which will, ever and anon through life, exert considerable control over our actions. When our Celtic ancestors—in the very darkness of their ignorance—were taught by their fears a Pantheistic religion, when the bubbling of a spring and the flight of a bird were charged with sentences of life and death, then was moulded the Celtic mind: it was a religion of terror: the idea of the childish "bogle" was present in the philosopher: so too these early impressions have not been entirely obliterated from the Celtic mind; the wild dreams which swayed so irresistibly the skin-clad Briton of the Cornish hills have not yet lost their power even where school boards are busy with the people. Their first Christianity was merged in superstition to a large extent, and as we shall see formed a basis for many new legends: the isolation of the county formed a bulwark for these beliefs. It was not till John Wesley's day that any real blow was aimed at them; the last of those travelling bards who existed in Cornwall till 1829, and did so much to keep alive the old legends, always avoided the houses of the Methodists, the Conorums as they were nicknamed. The second cause is I believe the character of the country itself; anyone who has been on a walking tour in Cornwall will have been struck by the wildness of the country, the dark and rock clad hills of Sennen and St. Ives, the bold cliffs, the masses of granite, the old druidic remains, the howling moorlands of the north, the sterile tracts of Gwennap, the quaint wells, the cromlechs, and circles, to all of these superstitions cling, and who can doubt that their very character had a great influence in forming those superstitions. Such then being some of the causes which may have fostered superstition in Cornwall, we will quickly glance at a few of the legends themselves, beginning with those of the giants as they seem to have belonged to the earliest times. Wherever we wander over uncultivated tracts, which still retain their wildness, we are certain of finding rude masses of rock which have some relation to the giants; the giants' hand, the giants' chair or the giants' punch-bowl excite your curiosity, and it would be interesting to discuss their origin or their relation to the Scotch giants of Cromarty, but this is not my object to-night: suffice it to say that many of the nursery tales, with which we are so familiar, originated in Cornwall, Jack the giant-killer himself being a Cornishman. One story which I cut as short as possible:—There once lived a mighty man called the Giant-Bolster on Carne-Buryanach or St. Agnes Beacon, his stride was such that he could rest one foot on this hill and one on Carn Brea, six miles distant. In proof of this a stone remains in a valley between on which the impression of the giant's fingers remain where he stopped to drink when enjoying his usual stride. He was a tyrannical husband, and made his wife pick up and

pile the boulders strewn on the carns, the proof of which are the still existing piles; however, he was also unfaithful, and fell in love with St. Agnes who lived in the valley below: the saint wishing to be rid of him told him she would be his wife if he would fill a small hole in the cliff with his blood, which such a bestrider of hills could easily spare. The giant consented, stretched his arm across the hole, plunged in his knife, expecting to see the hole filled in a minute or two. Hour after hour the blood flowed on till the giant fainted and died. The saint was well aware that the hole communicated with the sea. Mrs. Bolster and the saint were both relieved. The mark of the blood still remains to prove the story, and this, with the mark on the rock and the piles of stones, is enough in the eyes of the country people to prove a whole fabric of legends built up on this, of which I have given a brief outline.

Next we come to the very opposite of the giants—the "small people," a sort of fairy, of whom their are various sorts such as the Spriggans, Piskies, Buccas or Knockers and Brownies: they are by some supposed to be spirits of people who inhabited Cornwall many thousands of years ago, before the Birth of Christ: they are not good enough to go to Heaven or bad enough to go to hell; they are called the "poor innocents" (a phrase now applied more often to silly children): they are getting smaller and smaller, and will eventually turn into ants or "muryans" as they are called. Another idea is that they are Druids who continue to diminish because they will not give up their idolatries. A man in the parish of Lelant told a clergyman known to myself that he had witnessed the Piskies meeting in the Church of that parish, where they are supposed to meet to perform certain funeral rites over their friends: the church is on a wild spot on the towans, and of course directly the man saw the lights in the church he was so frightened that he ran away. The miners still assert that they hear the "Knockers" when working underground, and their presence is held to indicate a good lode of metal.

The next kind of superstition may be best called "romances of the rocks," and are for the most part "aetiological," the stories having been made to explain their queer shapes: the fixed belief of the peasantry till quite lately was that no human power could move stones rendered sacred to them by traditionary romance, when the commander of a revenue cutter removed with a party of his men the Logan Rock, to prove the folly of this prevalent superstition, he did but little to dispel the old belief, and proved himself a fool for his pains, as he was compelled to spend a large sum in replacing it. The cromlechs are perhaps the most peculiar, consisting of three upright boulders of granite with a large flat piece often weighing many tons resting on them, their real explanation seems to be

that they were set up as monuments to chiefs in days when the labour of the masses was employed for such works as we know it was for the pyramids in Egypt. When taking a walk near Penzance some time ago, I visited a pile of rocks called Tolcarne. Their appearance is just as if a heap of fishing nets, such as the Cornish use, had been petrified, the ropes, pieces of cork, and even in some places the meshes being quite plainly seen in the granite. I was told by a person who lived near that the real explanation was the following: The Devil stole some fishermen's nets from Newlyn, a village on the opposite hill, and ran off with them; while he was departing the choir and priest of the Church close at hand came out singing a hymn, whereupon the devil dropped the nets and they turned into stone, as they now are seen. The same story was told my brother a week or two ago.

This legend, however, clashes with another, viz, that the Devil never came into Cornwall at all. When he got to the Tamar he heard, they say, that the Cornish had taty-pie, sheepy pie, leeky pie, in fact, all manner of pie or pastry as it is generally called, so being afraid that they would have devilly pie as well, he thought best to stay in Devonshire. It is noticeable that while in other counties most queer formations of rocks have something to do with the devil, in Cornwall he is rarely associated with them.

It is a curious fact that while in the western part of the county the marks on rocks are attributed to giants, in the eastern part they are mostly connected with legends of Arthur, Arthur's beds, chairs, caves, quoits and horseshoes, being frequently met with. Dr. Borlase has tried to prove that the rock basins were the work of the Druids, but it seems more probable that most have been worn away by the action of the weather, there being very few of which it is absolutely certain that they are the work of men. Many of the cromlechs are believed to have healing properties, and cases have occurred quite lately of children being drawn in under them and three times round them in a direction contrary to the sun: this being a certain cure in the eyes of the people for various diseases. Another curious property is attributed to a stone in Morva, and also to several others in different parts of the county and on Dartmoor. These stones are either "forked," that is two resting against each other so as to form a triangle, or "holed" with a round hole worn through them, and to crawl through the openings, is supposed to be a sure cure for rheumatism or lumbago; in some cases, to complete the cure, the operation has to be performed nine times. Most of the curious rocks around the coast have stories attached to them, but these are too long for me to enter into at present

I remarked above that the first Christianity of Cornwall formed a basis for many new legends, and some of these, as we saw in the story of the giant Bolster when he fell in love with St. Agnes, got curiously mixed with the

older traditions. When the first Christian missionaries dwelt among the people they impressed them by their bravery and endurance under persecution, and by the holy lives they led; being morally superior to the men of their times they were represented as physically so to their children, and added to the assertion of their miraculous powers by the earlier priesthood themselves, we have no difficulty in seeing how the ordinary man has gradually become a hero. Nearly every parish in Cornwall bears the name of some saint that made it his abode, and the influence their religion had on the people is testified to by the number of ancient crosses set up by the roadsides and still to be seen, if the stranger takes the trouble to enquire after them.

The first legend of the saints which I will read is an example of what we may perhaps call their 'Titanic' properties, arising from their being confused with the giants. "St. Just from his home in Penwith, being weary of having little to do, except offering prayers for the tinners and fishermen went on a visit to the hospitable St. Reverne. The holy brothers rejoiced together and passed most of their time in eating and drinking. St. Just envied St. Reverne a goodly chalice from which he drank the richest of wines, and when the time came that he felt he must return to his flock, he departed with many vows of friendship, begging St. Reverne to return his visit. The latter on the departure of St. Just missed the cup: diligent search was made, it could not be discovered, and the saint found he had been deceived and robbed. His rage was excessive. He felt his wisest course was to pursue the thief, inflict summary punishment on him, and recover his cup. Away he started, and over Crowza Downs which lay in his road, some boulders of 'Ironstone' caught his eye; he whipped a few of these massive pebbles into his pocket and hastened onwards. When he drew near Tre-men-keverne, he spied St Just: working himself up into a tremendous rage, he increased his speed, at the same time hallaoing to the saintly thief who pursued his road in a well-assumed quiet of conscious innocence. Loud and long did St. Reverne call on St. Just to stop, but the latter was deaf to his calls: at length coming within a stone's throw of the dissembling culprit, and calling him a thief, adding thereto some of the most choice epithets from his holy vocabulary, he took a stone from his pocket and let fly after St. Just. The stone falling heavily by the side of St. Just convinced him that he had to deal with an awkward enemy, and that he had best make all the use he could of his legs: he quietly untied the chalice, which he had fastened to his girdle, and let it fall to the ground, at the same time taking to his heels: St. Reverne saw the cup glitter in the sunshine: he had recovered his treasure; he could get no good from his false friend; he was jaded with his pursuit: therefore he took the stones one by one from his

pockets, and hurled them at the retreating culprit, cursing him as he went. There the pebbles remain as they fell; the peculiarity of the stones being in all respects unlike anything around, but clearly resembling the Crowza stones, attesting the truth of the legend; their weights, each being several hundred pounds, proved the power of the saint. Many attempts, so the people say, have been made to remove these stones. They are carried away easily by day, but always return to the place were they now repose by night. This story seemed to me a good illustration of the many which rise from the supposed gigantic properties of the Early Saints. I have chosen a second from those which have nothing to do with the giants, principally on account of its brevity. The Church of St. Leven is ornamented a good deal with carved work, the chief device thoughout the building being two fishes on the same hook. These are to commemorate a remarkable incident in the life of the Saint from whom the parish and consequently the Church takes its name. One lovely evening, at sunset, St. Leven was on the rocks fishing. There was a heavy pull on his line, and drawing it in he found two breams on the same hook. The good Saint anxious to serve both alike, to avoid, indeed, even the appearance of partiality, took both fishes off the hook and cast them back into the sea. Again they came to the hook and again were returned to their native element. The line was no sooner cast in the third time than the same two fish hooked themselves once more. St. Leven thought there must be some reason unknown to him for this strange occurrence, so he took both fishes home with him. When the Saint reached Bodellen, he found his sister, St. Breage, had come to visit him with her two children. Then he thought he saw the hand of Providence at work in guiding the fish to his hook. Even saints are blind when they attempt to fathom the ways of Providence. The fish were, of course, cooked for supper, and the Saint having asked a blessing, they sat down to partake of it. The children had walked far, and were ravenously hungry. They ate their suppers with rapidity, and not taking time to pick out the bones were both choked. The apparent blessing was thus transformed into a curse, and the bream from that day forward has ever gone amongst fishermen by the name of *choke-children*. There are disputes as to the fish concerned in my story. The St. Leven fishermen say it is the chad, but the name given it as well as it's bony structure are in favour of the bream. At any rate those of you who happen in future to partake of bream should remember the legend of St. Leven and be careful about the bones. The path along which St. Leven walked from Bodellen to St. Leven's Rocks, for they still keep his name, is pointed out by the people, and the grass grows greener, so they say, wherever the good priest trod than in any other part of the fields through which the foot-path passes.

St. Pirran, St. Keyne, St. Germans and many others of whom there are most interesting legends I must pass over, to come to the *Holy Wells* or *Well-Worship*. A spring of water has always seemed to have something about it which gives rise to holy feelings: the purity of the fluid impresses itself, through the eye, upon the mind and it's power of removing all impurity is felt to the soul. The Hydromancy of Greeks is seen in the legends of the Castalian fount: in our own religion water is an important symbol; wash and be clean is the murmur of the waters as they overflow their rocky basins: if this is our own feeling when gazing on a spring of water, how much stronger must it have been in the half savage people of early times. One thing is at any rate certain that the Cornish have been most religiously careful about their springs; in almost every parish there is a Holy-Well carefully walled round and to almost every well special properties of healing are attributed. I suppose most of you have heard of the well of St. Keyne, a well to which the saint imparted the strange virtue that whichever of a newly-married couple should first drink of it was to enjoy domestic sovereignty afterwards. Spoken of by Southey as

"A well there is in the west country
And a clearer one never was seen,
There is not a wife in the west country
But has heard of the well of St. Keyne.
An oak and an elm-tree stand beside,
And behind doth an ash-tree grow,
And a willow from the bank above,
Droops to the water below."

The trees having been cut down, it is now supposed to have lost the virtue imparted by the saint, though new ones have been planted. Several wells, among them one at Redruth, are supposed to have such powers that no one christened in them will ever be hanged: others are supposed to prevent insanity; and one I know of at Perran on the coast, issuing from the rock, through the cleft of which children have been, and I believe still are, dragged to cure several diseases.

I will conclude with some instances of the belief in witchcraft, with some of the superstitions peculiar to miners, amongst whom I live myself.

That a deep rooted belief in witchcraft exists in Cornwall, and doubtless in other parts of the country there, cannot be denied. A few years since our own gardener, who is a thorough old Cornishman, was working in the garden in the middle of the day. Turning round he saw a woman picking some apples from one of the trees, and putting them in her apron; he told her to desist, and summarily sent her about her business, not however before she had taken a good glance at him and the tree, at the same time muttering

some queer incantation. That tree has *never* borne well since, what fruit there is is always small and inferior. Nothing will shake the belief of the man that the woman bewitched the tree, and thus caused its failure. No other reason is to be found for the failure of the tree, but you have the facts for yourselves.—The father of a present Marlburian told me the following story of his own experience: a sick old woman and a young child were left in the same cottage: the child when playing on the hearth set fire to her clothes and rushed out of the door: the old woman of course could not leave her couch: the neighbours soon arrived on the scene, and in a few minutes extinguished the flames: the child turned out to be very little hurt, and the people were much astonished at the little harm she had taken: the clergyman who told me the story happened to advert to the subject when visiting the old woman, whereupon she remarked that *had it not been for her the child* would have been burnt to death: my informant was much astonished at this, knowing that the old woman was bed-ridden, and, after very close enquiry, got from her that she had used a form of words or incantation, believing herself to possess the powers of witchcraft, and that this had rendered the flames powerless to hurt the child.

The miners have many quaint superstitions which belong to them alone. I mentioned the "Knockers" who are supposed by some of them to be spirits of the dead Jews or "Finicans" as they call them, a queer jumble of Jews and Phoenicians: these are generally to be heard on a good lode of metal, the bad ones being frequented by sprites or demons. A miner will never allow whistling underground nor the sign of the cross to be cut in any way if it can be helped. If miners see a snail when going to "bal," *i.e.*, to mine, they drop a piece of tallow from their candles by its side to avert the omen. At a mine called Wheal Vor it always has been believed that a fatal accident in the mine is foretold by the appearance of a hare or white rabbit in one of the engine houses. The men declared at one time that they had chased these appearances till they were hemmed in completely. The white hare on one occasion ran into a pipe, was stopped entirely in, and yet escaped. Many years ago a boy was killed at the same mine by the untimely explosion of a charge of blasting powder; when his mangled remains were brought to the surface, a bystander, to spare the feelings of his relatives, threw the whole mass into the furnace of the engine close at hand. From that time the enginemen declared that troops of little black dogs haunted the place: few liked to talk about it, but it was difficult to obtain the necessary attendance to work the machine.

The belief in charms is very strong, especially when used as a cure for bad eyes or other diseases: I have quite recently known instances of people going to be cured this way to people at a distance known in the

neighbourhood as possessing this power. Also certain people are supposed to have the power of curing warts; there are many special remedies for them too: one I will mention: *steal* a piece of meat from a butcher's shop, rub the wart with it, and bury it *secretly*, no one must be told: but as the meat decays, so will the wart shrivel up and depart. I will simply mention one or two of the popular superstitions—it is unlucky to bury on the north side of the church; when a person is suffering on a death bed any bolt or lock closed in the house retards his death: a corpse is never to be carried to church by a new road: a raven croaking over a cottage fills its inmates with gloom; to whistle at night brings misfortune; to meet on the stairs is unlucky, and one party must retire backwards to avert the omen (this superstition prevails also in the midland counties); servants must never be engaged on Friday; you must never omit to raise your hat to a magpie or sorrow will ensue; but the most ill-omened thing of all is to tread on graves, as Coleridge said:

"To see a man tread over graves
I hold it no good mark;
'Tis wicked in the sun and moon
And bad luck in the dark."

These few examples will, I think, show the general character of these feelings which are the inner life of the Cornish people: it will be understood by all who have studied the peculiarities of any Celtic race that they have ever been a very impressible people, they have observed the phenomena of nature and interpreted them with hopeful feelings or despondent anxiety, according as they are surrounded by cheerful or by sorrow-inducing circumstances. The word "whisht," spelt w-h-i-s-h-t expresses exactly those feelings which lead them to find a sign or token in everything: one would desire that these old superstitions should be preserved: they illustrate a state of society in the past which will never return again: but they *must* inevitably fade as a knowledge of nature's laws become more and more disseminated among the people: Cornwall is now opened up, railways run through it: education is spreading fast: still there is I am sure in the words of the poet:

"The lonely mountains o'er,
And the resounding shore,
A voice of weeping heard and loud lament;
From haunted spring and dale,
Edged with poplar pale,
The parting genius is with sighing sent."

MEETING HELD MAY 30TH, 1878.

The minutes of the last meeting were read and confirmed, and O. Elton, and W. M. H. Milner gave their reports on the Entomological and Botanical work of the previous fortnight.

The President exhibited a specimen of the Tway-blade (*Listera ovata*) on one of the flowers of which a small insect had been caught; also a set of the plants which had come into flower since May 16, collected by W. H. Milner, F. S. Alston, E. T. Sankey, D. A. Hailes, and others.

N. Masterman, Esq., read the first part of a paper on the "Antiquities of the Neighbourhood of Marlborough."

A discussion ensued in which C. Sankey, Esq., supported the "Sacrificial Theory," *i.e.*, that Silbury Hill and the Marlborough Mound were high altars, possibly connected with the Temple at Avebury; this was opposed by N. Masterman, Esq., and T. O. Harding, Esq., who maintained that the larger barrows were only tombs; according to this theory the bones of some British hero are still mouldering at the bottom of our reservoir.

W. H. Chappel and D. E. Olivier also took part in the discussion.

There were 79 persons present. 4 hon. members, 35 members, and 40 visitors.

ANTIQUITIES OF THE NEIGHBOURHOOD.

PART I.

We are fortunate in being placed in the midst of so much open land—so many miles of broad turf which has never been desecrated by the farmers' plough, or worn away by any more destructive influence than the feet of strolling sheep and wandering hares. For me, these broad down-lands, with their smooth, carving hollows, their fresh breezes laden with the scent of thyme, their beauty ever changing with the Season of the year, possess a charm which I have never found elsewhere. It is true that the charm is not always the same, for Dickens has drawn in the Bagman's story (in Pickwick) a picture to make one shudder, of the miseries of driving through a freezing storm of rain and wind on the Marlborough downs—yet even in Winter they have a wild grandeur of their own—but in *summer* there is a perfection about the scenery of these Wiltshire Highlands which is unlike any other. You may lie on your back on the soft grass—a dozen larks are singing overhead; some you can see, others have become a "sightless song," the restless lapwings are wheeling and flapping round you as their name implies—further on a

Kestrel calmly sailing with motionless wings high in air—below in the hollows sheep bells are tinkling and thatched cottages nestling under the full rich foliage of elms, as only a Wiltshire cottage can—and higher up a copse of weatherbeaten firs is waving in the soft summer air, the home of hawks and long eared owls.

I might detain you long in raptures on down-scenery, so I will only recommend to those who love this country—first to study "The Scouring of the White Horse" by T. Hughes, and secondly to read a series of articles now appearing in the *Pall Mall Gazette* under the heading "Wild Life in a Southern Country," in which its features and fauna are described by one who must have observed them well.

But my present purpose is rather to point out one respect in which we owe a debt to these stubborn hills which have so well resisted the civilising plough—and have thus preserved for us so many memorials of byegone times that I doubt whether any country is richer in relics of antiquarian interest.

It is true the Romans and Saxons have not left us much—though we have Roman roads and camps, and a white horse cut by the soldiers of Alfred the Great—(for a Roman town with its mosaic pavements vases and 1000 articles for use or ornament, we must go as far as Bath or Cirencester). But the Britons have left us a great deal—and, Saxon as we are by birth, we must confess to a strange interest in those old Celts who have left their bones to moulder in the barrows on our downs, and who carry our minds back to a still more distant past.

My preface is growing somewhat long, but I do believe that most fellows know very little of the beauty and interest of our surroundings here—we are for so much of our time slaves (of necessity) to class-room and cricket-field, that the number of those who have visited Barbary camp (five miles) or Wansdyke (six miles) or who even know the forest well, is very small. But the summer term does not offer opportunities for walks, and if I can induce any who are not great at cricket to take some delight in down scenery and down antiquities, I shall feel that there is no need to apologise for writing you a paper which contains nothing original—nothing which you might not extract for yourselves from books in the shelves of the Museum and especially from that most interesting of periodicals, the Wilts Archæological Magazine.

I shall begin with the oldest of our relics—the *Barrows*—in fact my paper must be confined to day to mounds—I am sorry not to be able to deal with temples, camps, roads, dykes, and horses all at once—but the subject of Wilts Antiquities is wider than it seems and I must keep them for another day.

First, then, for the smaller *barrows*—those little round hillocks which are dotted about our downs in all directions, sometimes singly on high points,

sometimes in clusters, and now and then covered with a wood of little firs—or a few weatherworn trees of larger size—under which the old warrior is resting from his toils. These are the graves of the earliest inhabitants known to history. Nor are they confined to England. All over the world, wherever the land is open and undisturbed we find traces of the same primitive form of burial—it is kept up by Red Indians at this day—our own mound and Silbury Hill are only larger graves of mightier chiefs. And the Pyramids of Egypt differ only in shape and size from these simpler tombs. It may be that each member of the tribe was bound to contribute something to the heap, as in the story of the horse of Abou Zenneh, on whose tomb every passing Arab must throw his handful of earth or stones, saying "Eat, oh horse of Abou Zenneh," a custom which lasted long after the story of the horse had been forgotten.

Most of these barrows have been opened, and their contents are always much the same. There are first the bones of men, often complete skeletons in different attitudes—and with these the remains of dog, horse, pig, ox and red-deer. The implements are of flint—not metal as they would have been in Roman or Saxon times—there are urns, both ornamental and to hold the ashes of the dead, proving that cremation was a custom with them too, in fact we cannot separate burning and burial into distinct periods. The pottery of these urns is quite different from that of Roman or Saxon, (the clay has been burnt not sun-dried). Amber and gold ornaments are rare but sometimes found.

In one case even bits of woollen stuffs were found, and a row of buttons in front of the breast of a skeleton: in another not far from Everley, the Celtic hunter and his dog were reposing in the centre of a ring of red deer's horns, the trophies of some ancient chase.

Nor are the barrows alike in form, in all places—some are surrounded by a ditch or ring of stones, whether to keep off spirits from the dead, or to restrain his restless spirit from wandering among the living—these are called *bell-barrows*—and many of ours have the ditch—or again a group of barrows are surrounded by one trench. But the two main divisions are the *long* and *round*, and I must tell you first that I have never seen a good instance of the latter among our mounds, many of which look long in profile but on a nearer view, are round as is the case with the two nearest Rockley which are called long in the Journal. Of these the *long* are probably the oldest and belong to an earlier race called the Dolichocephalic or long-headed men, whose features must have been softer and smoother than those of their successors. The latter are the brachycephalic or short round-headed race, whose remains are found mixed with the others in the later round barrows, and who would

seem to be a stronger race which conquered them. The jaw-bones also differ.

I have never made a list of the barrows in the neighbourhood, nor would it be a very easy task—so common are they—but the greatest number to be seen together in our immediate neighbourhood are just before the village of Kennett, a few miles down the Bath road.

Next to the barrows we must take the *Cromlechs* of which we have such a good example in the Devil's den, and they are closely connected, for many writers hold that all our cromlechs were originally covered by mounds, pointing to some in Wales which have been stripped within the last century, where again we find a twofold division. The *Danish* barrows have the cromlech on the top, and perhaps originally it was buried except the upper stone, and in some in Guernsey and Brittany there is a covered passage leading to the chamber where the bones were laid. The British have the stones inside and are without the passage, but in either case it would seem that the cromlech formed the inner chamber of a burial mound, and if we ask why the stones are not always flat it is enough to consider the difficulty of working on hard stones with a flint hatchet. Those who hold a different view can only explain their construction by the theory that the upright stones were planted first and covered by a mound with a gentle slope up which the top stone could be drawn, and that the earth was afterwards removed, and they have still to account for the motive which could lead to the erection of such strange monuments at cost of so much labour.

I need not detain you long over the question of *Orientation*. We are told that by far the greater number of cromlechs lie East and West, and hardly any North and South—a few are found to point N.E. or S.E., which perhaps were made at a different season of the year, a variation noticeable also in Churches—whether we can build on this any theory about sun-worship seems doubtful to say the least.

The derivation of the word Cromlech has aways been a puzzle. On the one hand we are informed that it comes from two simple words "crum," which signifies bent, and "lech" a broad stone; is not the meaning obvious? A broad stone was erected, and people bent down before it. Hence the cromlech must have been an altar. Wiser heads can only tell us that it is a late word which looks Celtic, and that nobody knows what it means.

I have spoken of the smaller Barrows and their contents. Now for the *great ones*, of which we have two such noble specimens so close at hand, and I think you will see good reason to believe that these are only Barrows on a larger scale intended for the same purposes of burial, though it may not be quite easy to estimate the majesty of the chieftain who is honoured by such

a giant tomb as our Mound or Silbury: he must have been a greater than Saul or Agamemnon, tallest by more than head and shoulders of his tribe

Silbury Hill lies about six miles from Marlborough, on the Bath road; it is 130 feet in height and covers five and a half acres of ground; compared with this the mounds we have spoken of (except our own) are dwarfs indeed. It is the largest artificial hill in our Island, but others elsewhere resemble it, and a few must be mentioned here In County Meath, Ireland, there is or was one of these colossal barrows called the "New Grange," 70 feet high, and long employed as a quarry, in it were found urns and chambers as we might expect.

In America and New Zealand they are common, and indeed all over the World, but without wandering so far, I may just mention what was apparently the biggest in Europe, a vast mound 250 feet high on the Steppes in South Russia, which took five years to move, and was found to be full of relics of all kinds, it was in fact one of those tombs of Scythian Kings of which there are many in the same district, and of whose construction Herodotus says, "The King is placed in a four-cornered excavation, after which they set about raising a great mound, vying with each other, and striving to make it as large as possible." Let me repeat the size of Silbury. It is 130 feet high, and covers five and a half acres, a stupendous work, and if one should slide down (as I have often done) upon a board in Summer time, when the grass is dry and slippery, a very considerable velocity may be attained before reaching the bottom.

It may increase our respect for the Britons to consider that every ounce of it must have been carried up in baskets on the heads of men; time was of course no object, the whole tribe might be set at work, for they had little else to do but hunt and paint themselves and fight; and as for the comfort of their heads we know that this is a favourite way of carrying weights, from the case of the Negroes, who being employed to make a railway, and furnished by a paternal Government with wheel-barrows, preferred to hoist that useful vehicle on their heads, and march along spinning the wheel to a tune.

Silbury has twice been *excavated* with a two-fold purpose, partly to prove the burial theory, and also to fix the date of its construction.

The first excavation was made by Cornish miners, at the end of the last century (1777), from the top, in which a great hole may still be seen, the object being to reach the centre, and if possible to discover the sepulchral chamber which contained the mighty dead giant's bones. Nothing was found; but indeed it would be strange if the workmen had hit upon the right spot in so vast a mound, for the builders would not plan the circumference at starting, and in heaping on the earth they would soon forget their centre. This was actually the

case in a much smaller mound in Brittany, in which by chance a cromlech, and remains were discovered very much at one side.

At the *second attempt in* 1849, a tunnel was driven to the centre, where an urn was left with a record of the work. By this the hill was proved to be the work of man, as the turf of the old surface was found to extend underneath the mound, and below this again the soil was undisturbed, while that of the mound itself was evidently raised by artificial means; this attempt was equally unsuccessful in discovering any relics; still less were they able to verify the tradition which asserts that somewhere within the hill a gold horse and rider yet remain to be found.

The artificial nature of the mound being thus ascertained, it only remains to fix the date, if possible, and the great point on which the discussion has always turned (in absence of any relics in the mound) has been the question of the Roman road; these roads we know were always drawn in straight lines, and the Roman love of directness would not allow of a deviation for any less obstacle than such a hill as Silbury: if therefore it could be proved that the road here turned aside, it would be certain that the hill was there before the road was made. But the point is and must remain unsettled. We know that the road went from Mildenhall (Cunetio) to Verlucio, a course which would take it straight through Silbury, but of this road hardly any traces now are left. We are told that not far from the mound it may still be traced in cornfields, where the colour of the crops in autumn marks its course (and in winter by the snow which lies there longer than elsewhere), and Stukely writing 150 years ago described the turn of the road, and drew sketches to illustrate what may *then* have been clearly marked.

But indeed, a more general argument will suffice for most of us—if the hill was not the work of Celts, by whom then was it made—certainly not by Romans who never made such useless works—nor even by those later Celts the Belgæ, whose boundary lay 2 miles off—so that in the words of the writer from whom these facts are drawn we may fairly feel assured that this grand old mound was "contemporaneous with the siege of Troy, the wanderings of Ulysses and the period when Jephtha judged Israel."

Our own mound may claim a like antiquity—though it has suffered in size from its use first as the keep of a feudal castle, and at a later period to carry the spiral walks of a pleasure ground. Even the yews whose dark leaves mingled with the brighter foliage of the other trees have added so much to its beauty, have also no less obscured its shape so that it is not easy from any point to judge of its real height. No doubt it contains the bones of some departed hero, as well as the cistern which supplies our water and the remains of those grottos which amused the old Countess of Somerset. Tradition even tells us that the great wizard Merlin lies buried here, whence the name

Merleberg, which occurs in Domesday book, though some of us may be contented with the simpler derivation from the Marl of our Chalk downs.

Two more mounds may here be mentioned—both over warriors slain in battle and both showing that more modern nations have not given up the Celtic fashion of honouring their dead. The first, the great mound of Marathon, that time-honoured monument of the noblest day of Athens; and another, the one most like Silbury in size is that erected over our Belgic allies at Waterloo. It is of the same height though not of equal bulk, and on it stands a bronze lion cast from French cannon taken in the battle and looking towards Paris. The view of the field from this point is splendid, but one may regret the loss of a still more interesting spot in its construction, for the mound stands on that raised plateau which was occupied by the British Guards throughout that "day of onsets of despair, dashed on every rocky square;" the traditional scene of the call "Up Guards and at'em;" and it is said that the Duke himself visiting the field on a later day was distressed to find that the movement of the vast mass of earth required to make the mound should have obliterated the most interesting spot on the whole battlefield.

PART II.

BEFORE proceeding to any discussion of roads and camps, it seems necessary to consider in the first place what the country was like in those old days—how it resembled its present condition—and I think it is hardly possible to realise how great the difference must have been. History tells us that Forest Laws began with the reign of Cnut; and before this they were not needed, since there were not Forests, but one Forest, namely the whole island. Many writers say that the downs, as well as the low country, were once entirely covered with Forest; and there is no reason why this may not have been so. Fir trees and beech will grow well wherever planted, even on the most exposed height—as witness Martinsell, where that little copse of tall thin trees has braved the storms so many years, and our Forest starts on a down and covers hills which would otherwise be downs. Then what a change if you remove the plough from your scene. Instead of a landscape chequered with fields of every shape and colour dotted with farmsteads and villages, with the broad bright strip of green all down the Kennet's course, and the wide expanses of turf above on the Uplands, the traveller in a Celtic balloon would have looked down upon a pathless thicket of foliage; in some parts the primæval forest with gigantic oaks, in which the Druid pruned the sacred misletoe; in others an impenetrable jungle of thorns unbroken except by the straight lines of the Roman roads, along which Vespasian's legions tramped on their steady march; the valleys would have been dangerous Morasses where wild boars had their lairs, and perhaps beavers built their dams—as they did at Beverley; for abundance of wood means everywhere abundance of moisture too, and the Kennet and its tributary Og may have been mighty rivers in those days. A grand country it must have been indeed for our purpose, except that in those days the youthful climber might have found his course arrested by a nasty flint-headed arrow, clumsily formed perhaps, but aimed with most unpleasant accuracy by the British Keeper on whose domain he might be trespassing. The hills which are now so bare we may well suppose to have been thickly clad with fir woods and with beech, and only here and there would they be carpeted with that soft expanse of velvet turf which makes this country the paradise of those who love riding.

My object in dwelling on these points is not merely to suggest a picturesque if wild and rugged scene, but to show you that those who wish to understand the old days and the old relics, must put themselves under the old conditions. If we can restore in fancy those trackless forests and deserted wastes, we shall understand in a moment why there are camps on all the

highest points, and why the *British trackways* were traced along the ridges of the downs, only descending to the valleys when they were compelled to cross them. The Romans had a different purpose in view, their roads were driven straight from town to town, where the garrisons were posted to keep the province in subjection. But the old inhabitants who had no such scientific plans must have clung to the hills as their place of refuge, from whence a wide view could be commanded by the barbarian watchman sitting in the top of a tall firtree on the summit of the downs, and ready warning could be given of the motions of a secret enemy below approaching to plunder the herds of shaggy cattle, which would be driven hastily within the mounds and dykes of Barbury, while a huge bonfire as a beacon would warn the neighbouring camps to prepare in like manner for defence. This too may explain why the Wansdyke travels for so many miles along a ridge of downs, a peculiarity which has preserved him for us there in all his ancient grandeur, as it has preserved so many camps and barrows, and so much even of the old British Ridgeway.

This *Ridgeway* is I think our only clear example of a British road, it runs, or used to run, from the Lansdowne pillar beyond Avebury at which point its course is very plain along the Hackpen ridge to Barbury, and then across the Ogbourne valley to Liddington, and so to the Berkshire White Horse some 15 miles from hence. There too its course is very clearly marked, a wide grass road with a low mound on either side, along which the British drover, clad in his "neat suit of juice" (as a Modern School boy once expressed it) plied his flocks from camp to camp; and those who have studied their "Scouring of the White Horse" well, will not fail to remember the indignation of the little antiquarian clergyman as he surveyed the havoc made in it by the modern plough. I must say that for my part, in spite of modern civilisation, I incline to echo his sentiments.

The roads lead to the *camps*, and of these we have many fine examples, Those who have stood for the first time in Barbury camp, looking away from Marlborough, must have been struck with the sudden disappearance of the downs; behind you the bare uplands extend for miles, in many of whose valleys you are surrounded by turf, with no sign of cultivation in view, and might be at the end of the world; but in front the flat cultivated fields stretch away as far as the eye can reach (for 30 miles or more), and to right and left the downs are drawn out, broken by the valleys which pass through it at intervals; to the right beyond the break of the Ogbourne valley the downs begin again with a steep corner, on which you see the earthworks of Liddington three miles away, and beyond this again and out of sight lies the White Horse Hill in Berkshire, crowned by a camp of like form and size. Then to the left we have no camp till we reach the Lansdown pillar, where

a modern white horse has been cut just above the village of Cherhill, but the Ridgeway (as I said) seems to have connected this with Barbury, and we can easily see how from beacon to beacon in a moment might be spread the news of an approaching raid by some restless neighbouring tribe, and the cattle fattened in the Kennet bogs and brakes might be safely housed in time. Nor is this all, for between us and the Pewsey vale we have another wall of downs even more steep and unbroken. It begins at Martinsell, where we find a very neat little camp on the hill just above Oare; and two more near the Tan Hill (or St. Ann's Hill if that be the real name), where there is still an annual fair in August of ponies that run loose about the downs while it lasts. Two other camps I must mention, the first is Chisbury near Bedwyn, on the east side of the Forest, which a few of us visited three weeks ago; this is called in Murray "the finest example of British Castrametation in the county," and so no doubt it is if we regard the surface covered and the immense size of the mounds and ditch, these must have been more needed here where the ground is not so steep, and the camp, if it be a British one, would fill the gap between Barbury or Liddington and Martinsell, for the signals raised so high might be seen from far. But its beauty is of a more civilised type, the trench being filled with tall trees and thickets full of bright flowers, and it encloses a picturesque old farm and fields. It would seem that these camps must have been made to fence in our Marlborough district and preserve it from invasion.

The other camp which I mention is *Sidbury*: altogether outside our district and beyond the reach of most of us, but hardly to be passed over from its great interest and beauty. It stands on a high hill above the ridge of downs beyond the Pewsey vale, and may be seen from the furthest end of the forest, over Savernake. The position is commanding, but the camp owes its interest not to the mounds and ditch, which are small compared with nearer ones, but to three special points. First, the view of downland towards Salisbury and all round is magnificent, and well worth the journey at any time of year. Secondly, it is very curious in a geological way; the top being composed entirely of little round sea pebbles (of which I have brought a few) they are thrown out in heaps by the rabbits, and carry us back to a time when the sea spread over all this land, and when the Britons were only visible in the dim future to a most prophetic eye. Thirdly, in summer-time it is a marvel to see the mass of crimson flowers of the Willow-Herb, known mostly as a water plant, but filling this camp high above the plain and blazing everywhere under the hawthorns which stud the enclosure; there is also a clump of firs and beech, and the scene is enlivened by the rabbits popping in and out at every turn.

I have said enough to show that these camps *ought* to be British at least, whether they are or not, and we are fortunate in having some interesting relics here which were dug out at Barbury, and presented to the Society by the Rev. J. Harris. The Saxons made no camps, but preferred to fight like their descendants in the open field; and the Romans had their garrison towns, and would not be likely to fortify such barren uplands. We know also that they had no pockets, and always dropped their coppers about wherever they went; so that if this were their work we could not expect the Roman labourers to raise such vast earthworks without leaving behind him some traces of his presence.

Have we any real *Roman Camps* in our neighbourhood? We know many a battle unknown to history must have been waged during the long struggle which lasted through the reign of Claudius, made memorable by the names of Caractacus the champion of freedom on the one side, and on the other by the future Emperor of Rome, Vespasian.

Further, we know that the Romans made two kinds of camps—there were the permanent ones (called *Castra Stativa*) which served for winter quarters or for a prolonged defence. These must have been strong works like the British ones, except that from being at first the only safe places of refuge from attack, they grew in most cases into towns—hence so many of our most important towns all over England derive their names, as Chester, Lancaster, Doncaster, Winchester, Cirencester, you find them in almost every county, and the modern city has replaced the ancient camp.

But besides these greater works we know from Cæsar and other writers, that a Roman army never halted even for one night without throwing up a mound and ditch of no great size to guard against sudden attacks.

Now where should we expect to find the outlines of such camps if not on our open unploughed downs—for in all other places they could not fail to be obliterated by agricultural works—are there any in this neighbourhood?

Mr. Smith of Yatesbury, in a paper (in vol. xi of the Wilts Archæological Magazine) calls attention to the numerous traces of "Ancient Earthwork Enclosures" which are met with in open places—these are often very small and of every shape. He mentions no less than four along five miles of the course of the Wansdyke, and a short distance from it, and two more on Avebury downs—and quotes the opinion of Sir Richard Hoare, the greatest authority on Wilts antiquities, that they were the cattlepens of the early Brittons—their size and position would forbid us to reckon most of them as military posts, and it may not have been always possible or desirable to drive the cattle as far as the greater camps on the hills.

Still it is remarkable what a number of these enclosures are met with in following the Dyke from the Westwoods to its western end, and anyone who has traced its course in this part with an eye to the old times will hardly like to resign altogether the idea that in these squares on one of those nights in the dim past, were posted the detachments of a Roman army halting for the morrow when they would carry the great Belgic earthwork and advance on to the conquest of the Pewsey Vale and all that lies South of it. However, this may be in the case of these smaller enclosures there is one about eight miles from here, close to the furthest point of the Dyke on our downs, which is so large that 'in this one instance he assigns to it a military origin'—it is an exact square of about two hundred and twenty yards, covering therefore a large extent of ground, and here at least we may fancy a Roman army posted in its due array—the general's prætorium in front—the four entrances each in the middle of one side, *porta prætoria* in the front, *porta principalis dextra* and *sinistra* on each side, and *porta decumana* in the rear, the central space being mapped out with streets to seperate legionaries from allies, and horse from foot, with an interval between them, and the mound along which the sentry paced in silence through the night.

About *Roman roads* I shall not have much to say to-night. Those in our island were not laid down in the same durable style as the roads in the neighbourhood of Rome (*via Appia* the earliest) for which a solid foundation of concrete was laid down to the depth of some feet in a style which may recall our bathing-place, the surface paved with flag stones of all shapes yet so neatly fitted together that they have remained in many places uninjured by constant traffic to this day. Had our roads been made in this style they might well have defied the plough which has destroyed them except where they became identical in course with the modern highway. But in all provinces the roads formed part of a system for the control of the conquered country, the first step on the annexation of a new district being to form military garrisons at the most central points and to connect them by military roads, which ran direct from fort to fort in true Roman style—over hill and valley—turning neither to right hand nor to left except for some very serious obstacle.

Hence they are easily distinguishable from the British Ridgeways which run for most part on the open downs whilst the Romans keep to the valleys, and if those in our island are not marked by the splendid workmanship which has secured their permanence through so many ages near the capital, we may well admire the wonderful energy and perseverance of those earliest engineers who in such a rough overgrown country could drive a clear highway like

The Watling Street from London to the Forth, with a branch to Wales.

Ermine Street from London to Lincoln.

Fosse Way from Penzance through Exeter, Bath, and Cirencester to Lincoln.

Or the *Icknield Way* from Salisbury plain to the Eastern Counties.

The last two are the nearest of these great roads to Marlborough passing it however on opposite sides and at some distance. But they seem to have been connected by at least two branches in our immediate neighbourhood. (1). The road which runs from hence to Swindon through the two Ogbournes, on which those who travel this way in going home or coming back after the holidays may see their course extending for nearly four miles ahead in one unvarying line. A monotonous prospect of straight hard ground to be traversed which 'suggests thoughts' of the indomitable energy and stern perseverance of "those Neronian legionaries," who held our island subject for five hundred years. (2). The other which follows the general direction of our Bath road from Spinæ on the Icknield Way through Cunetio (Mildenhall) and Verlusio to Aquæ Solis (or Bath), or the Fosse Way, and which has become interesting for the question of which I spoke before whether its course was diverted by the obstacle presented by Silbury hill. We have said also that it may be traced in summer by the colour of the corn fields.

The temples of Avebury and Stonehenge. I mean to dismiss as shortly as possible partly because the former has just been chosen for description by a distinguished member of the Society and the latter from the subject of a printed paper in a previous Report; partly because a long account of either would need a paper to itself, so I shall only allude to a few points of interest concerning each.

Both are undoubtedly *temples*, for the theory that Avebury was a vast burying ground or military camp has been sufficiently disproved by excavations, but the marked difference in their structure is a clear sign that they belong to *different periods* and were made by *different tribes*.

Avebury is and was composed of monoliths (or single stones) alone, and could not have been a camp, since the mound is placed outside the trench and would afford a vantage ground to an attacking force. It covered at one time a vast extent of ground, the whole space enclosed within the works, so much of which is now taken up by the village, being filled by one large circle containing within it two smaller ones, while from an entrance on either side ran a splendid avenue of these huge sarsen blocks at regular intervals of a few feet apart to a distance of about two miles ending in small circles one near Beckhampton the other at Kennet. It must have been a splendid work so unlike

any object with which we are familiar and far superior to anything of its kind elsewhere, and our feelings are still more stirred by hearing that at so late a period as the end of the last century the avenues were almost entire, but the prosaic spirit of the Wiltshire farmer at length prevailed and a few more yards were added to his ploughland at the expense of a relic unexampled probably in the world. We are told that the stones on the road used to frighten horses at night, as if any one need travel there at night, and there are only left a few at intervals in solitary grandeur to mark their course; in one field eleven lying at intervals overthrown but not destroyed give one some notion of their size and relative position. Indeed we must thank the patriotism of Sir John Lubbock that the whole work at Abury is not destroyed in like manner. We may remember when the subject came up in Parliament, that unworthy member of our legislature who exclaimed against preserving any relics of those wretched barbarians of whom our Saxon ancestors have rid the world. Leaving this subject in better hands I pass on now to *Stonehenge* which perhaps may mean the "hanging stones" (whether from their position or their use in capital punishment.) One of the first parts which strikes one with something of disappointment on the first visit to this wonderful work is the small extent of ground it covers. Where is the rest? one feels, there must be more; but no, it stands compact in itself on a broad open plain of turf, offering in this respect a strong contrast to Abury, But the reason is not far to seek, the kind of stone is not found here, and must have come from far, and this brings us to one of the greatest puzzles of Stonehenge. We need not dwell upon the tale of their removal from Ireland by the magic arts of Merlin, and "that is more than these can tell," or the many theories about their origin; (those who need information of a detailed nature will apply to Mr. Long's interesting paper in vol. xvi., of the "Wilts Archæological Journal," and I shall only mention a few facts drawn from this). But we shall see that all the stones must have come from far; the arrangement or disarrangement being such that they could not be "twice told alike." Sir Philip Sidney, says "*no eie* can count them just," and it is mentioned as a merit in King Charles II. that he performed this feat on his return from Worcester battle.

Yet the plan is not so very hard to understand; there was (1) a ring of Sarsen Stones covered by others resting on them, so that the whole formed a ring with pillars at intervals of four feet, the height being between 21 and 15 feet, and the diameter of the circle 100 feet; within this stood (2) an inner circle of Syenite Stones, only four feet high: next (3) five great trilithons or cromlechs of three stones standing in a horse-shoe; one of these fell, owing to the curiosity of the Duke of Buckingham, who in James I's reign "did cause the middle of Stoneheng to be digged, about the bigness of two sawe pitts," which caused its overthrow; (4) Stood an inner ellipse of small stones

eight feet high of the same materials as those in the second circle. Such being the plan, we may notice several points of interest about the work. I have mentioned three well-known names of historical personages in connection with it, Philip Sidney, Buckingham, and Charles II.; Inigo Jones, and Dr. Johnson also thought this relic worthy of their notice.

But as to the workmanship, the stones we find are hewn, not rough'y set up like those at Abury, but squared, and the sides fairly flat; and moreover, they have been very dexterously fitted together. On the top of each of the upright supports rises a knob like an inverted basin which fits into a hollow on the underside of the stone which covers it. This proves the temple to have been a later work than that of Abury, and I shall mention presently a theory which seems to account well for it. But another question strikes us: how could the ancient Britons carve such hard stones? the Belgæ who made this temple were certainly acquainted with the use of metals, and far advanced beyond the rude barbarians whom they supplanted: but bronze will make little impression on a sarsen stone, and it seems they must have chipped away the sides with flint implements: this has been tried by writers on Stonehenge, and though many flints were broken in the process it was found that a result could at length be produced.

The most remarkable point of all is the nature of the stones: even the larger circles are composed of blocks which must have come from as far as Marlborough. They are the hard "sarsens" which we see in such numbers in the valley of Grey Wethers, near the Devil's Den, and of which the outer surface of our Chapel is built; they form a peculiar feature in our valleys here, though at the present rate of destruction they are not likely to do so for long, but on Salisbury plain they do not occur. It is strange how the old workmen can have carried them so far, but this is nothing to the difficulty of procuring the stones for the other two circles which are of syenite and other primitive rocks, and could be found no nearer than in Wales or Devon. This, as I have said, is one of the great puzzles of Stonehenge, the other being the nature of the religious rites there carried on, about which we may theorise freely without being hampered by the trouble of proof; perhaps the idea of human victims in wicker basket-work will be romantic enough to satisfy some.

I shall begin the subject of Wan's Dyke with a theory which has been accepted by several of the latest writers on these questions, and which has the merit of accounting for a great many things at once, and if I relate it boldly as a bit of history it may carry more conviction.

It is certain from Cæsar that much of the south part of Britain, especially the counties of Hants and half of Wilts and the Isle of Wight, were inhabited by the Belgæ a tribe of Gauls who came from France or Belgium,

Celts, like the Britons, but much more advanced in civilization, understanding the use of metals and agriculture, and keeping in Britain the names they had in Gaul. This tribe was notable among the Celts for its habit of making dykes as boundaries, and parts of four such dykes remain in these counties: their first invasion conquered Isle of Wight and a small tract of Hants, and a bit of the frontier line remains in *Bokerly* dyke near. A further advance was marked by two lines known as *Grune's* dyke and the *old* dyke, and the last of all was bounded by the great *Wan's Dyke*, of which it is said that 19 miles remain, and which must have extended from the Severn beyond Bath, where parts are traced south of the Avon to Berkshire, about 10 miles of it in our immediate neighbourhood, for it runs all along the downs between us and Pewsey; a mighty rampart there, in all its old grandeur with a trench and two mounds as large as the earthworks of Barbury, and you may see it winding away for two miles distance in some places like a great river, for the workmen do not seem to have been able to guide it straight, and the turns are frequent and remarkable. It would not of course be possible to defend such a long line, but it might serve to mark a boundary wall. The native tribes seem to have retired before the more energetic Belgæ till this point was reached, but here they made a standing, and sending ambassadors to the invading chief, explained to him that he had taken quite enough, and must at least spare their ancient Sanctuary of Abury, and the mounds at Silbury and Marlborough. This led to a conference and a treaty. The Belgæ did not want those ugly mounds, and scorned the primitive temple of unwrought stones. They had already fixed on Salisbury plain as the centre for their worship, and were only at a loss for materials with which to build, so it was agreed that the dyke should make a bend and leave the old shrines outside it, on condition that the old inhabitants should turn out *en masse* and haul the biggest of their Grey Wethers to a distance of 15 miles, and here in the centre of the plain was set up a temple of hewn and compacted stones to eclipse the ruder shrine of Abury.

A few more words about this grand old dyke: 2000 years old it is, though the only sensible derivation of *the name* is from Woden, the Saxon God, and must have been given later. I have mentioned the finest part of its course. The way to see it is to start at the further end. It leaves these downs two miles beyond Lockeridge, at which point it is covered by fir trees, then gets lost in ploughed fields, and is rather hard to trace if you try it as I once did by moonlight: two of us going, one each side, when the ditch got very narrow and tried to slink away in hedges, but it may be made out to the West woods; right through these woods it goes filled with hazels most of the way, and may be followed with one break as far as the railroad which it crosses at the point where the cutting is deepest, a mile from the

station; another mile of dyke stops short in ploughed fields half a mile from the forest, in which hardly any vestige of it is to be seen, but by following the same valley a ditch will be found which seems to have no purpose, and may be a part of it just before the lodge called Puthall Gate. Near Chisbury camp it again appears, and extends, I believe, to the Inkpen ridge of Downs, and no one can search it out from end to end without getting a fondness for such a very ancient relic of the past.

I may perhaps allude to the drummer boy in the Ingoldsby legends, whose sad fate was proved beyond a doubt by

"One Mr. Jones who comes forth and depones
That fifteen years since he had heard certain groans,
On his way to Stonehenge (to examine the stones
Described in a work of the late Sir John Soane's)
That he'd followed the moans, and led by their tones
Found a Raven a picking a drummer boy's bones."

I have detained you too long, and must be thankful for great indulgence shown to me to-night, but this will close my slight account of antiquities. British villages are said to exist in the pits on Martinsell, and near the old well on the other side of the railway, but whether this has been verified I do not know. Something might be said if any would care to hear it on the white horses of our neighbourhood, and on the famous Wiltshire highwaymen who ruled this district, and exacted their black mail on the downs not long ago. But these, with the exception of one horse, which is out of our county, cannot be called antiquities, and I must end here for to-night.

FIELD DAY, JUNE 8TH, 1878.

About 35 Members went to Binck-Knoll, and several Masters rode over in the course of the afternoon. About 170 species of plants were found in flower and 62 Ornithological notices were taken. The weather was not sufficiently bright for much Entomological work.

MEETING HELD JUNE 13TH, 1878.

After the minutes of the previous meeting had been read and confirmed, the President announced that T. O. Harding, Esq., had kindly consented to superintend the Conchological department. N. Masterman, Esq., O. Elton, and W. M. H. Milner, then reported on the work done in the different sections; the Botanical notices of the previous fortnight were exhibited, and a case of Moths and Butterflies by N. Manders, Esq., O.M.; also a specimen —the second caught at Marlborough—of the Orange Footman Moth (*Lithosia Aureola*) taken by F. S. Alston. The President exhibited a specimen of the fruit of the Sago (*Sagus Ruffia*) on behalf of Mrs. Hulme; a twig of Sloe with the fruit converted into long bladders, sent by G. E. Dartnell, Esq., O.M.; and a daisy half red and half white, found in Rev. W. M. Furneaux's garden.

F. E. Hulme, Esq, then related some of his early experiences in Natural History. A story of an attempt to dissect a dead dog, and some anecdotes of burying beetles caused some amusement. Also an instance of strong attachment to man on the part of a jackdaw.

O. Elton made some remarks on the Entomological part of Mr. Hulme's paper.

A specimen of Roman Pottery and some fossils from Binck-Knoll were exhibited by D. E. Olivier; and a series of specimens of tin, and tin products was exhibited by the President.

There were 76 persons present, 3 Honorary Members, 31 Members, and 42 visitors.

MEETING HELD JUNE 27TH, 1878.

The minutes of the last Meeting were read and confirmed.

The President exhibited a monstrosity of a Geranium, and made some remarks upon the fact of the wet weather having caused an unusual number of such monstrosities.

The Botanical and Ornithological notices were then read, the former especially giving evidence of increased activity amongst the Members. N. Masterman, Esq., read the second part of his paper on the "Antiquities of the Neighbourhood of Marlborough."

A discussion ensued in which L. E. Upcott, Esq., mentioned that a man of the name of Jack Robinson first discovered, by accident, the method by which the Sarsen stones could be split into gate posts; which has caused the destruction of a large number of those interesting geological remains.

There were 64 persons present, 5 Honorary Members, 27 Members, and 32 visitors.

CONVERSAZIONÉ HELD JULY 2ND, 1878.

The Conversazioné this year was given jointly by the Natural History and Art Societies, the former taking the Bradleian, and the latter the Adderley Library. Among the objects exhibited in the Adderley were an original by Elijah Walton, of Lake Thun, lent by Mr. Beesly; a collection of modern French china by Mr. Richardson; exquisite antique china, by Mr. Thomas; views of Egypt and other places, with some old Greek vases by Mr. Rodwell; and a rare collection of photographs and engravings, by The Master and Mrs. Bell, Mr. Mansell, and Mr. Drury.

In compartments round the Bradleian were a collection of Skulls and Skeletons; Chinese and Indian Curiosities; a Spectroscope, lent by Mr. Rodwell, and exhibited by H. M. Elder; Botanical Models and specimens, among them being a collection of gums, presented by Rev. C. E. Thorpe; a collection of Brazilian Insects; a selection of British and Indian Moths and Butterflies from the Society's Collection; a collection of rare and beautiful birds, mostly lent by Mr. E. Gerrard, jun., of London; a Peruvian Mummy; a selection of Minerals and Fossils from the Society's Collection; and a fine and interesting group of cased birds. The centre of the room was occupied by a table with four Microscopes, kindly lent by Messrs. Beck and Beck; a large collection of over 300 wild plants in flower, and the Society's Collection of Coins, over 700 in number. Mr. Hulme kindly lent his diagrams, which were arranged round the walls; and both Adderley and Bradleian were tastefully decorated with flowers and ferns by Mrs. Booth, and the Misses Preston. The College liberally supplied tea and supper for the visitors, of whom there were about 80 from the town and neighbourhood. The majority of the Common Room and about 120 of the School were also present.

MEETING HELD JULY 11TH, 1878.

The President announced the donations of the Rugby and Clifton College Natural History Reports, and the 7th vol. of the United States Geological Survey. W. H. Chappel was nominated by the President as Secretary for the ensuing year, and three vacancies in the Committee were filled by the unopposed election of T. O. Harding, Esq., O. Elton, and W. H. E. Worship, the former taking the place of F. E. Thompson, Esq., who had resigned. A vote of thanks was proposed by W. H. Chappel, and carried unanimously to the retiring Secretary, W. M. H. Milner, who in acknowledging the compliment made a few remarks congratulating the Society on its present satisfactory condition.

The President then announced that the prize, offered for the greatest number of notices to Members below the VI Form, had been gained by F. S. Alston, who was far the best in Botany, and one of the best in Entomology. Pearce in Entomology, Hailes and Sankey in Botany, and Fenwick in Ornithology, had also worked very well.

A very interesting paper on "Ants," was read by O. Elton. The following exhibitions were then made. An Abyssinian Bible and Prayer Book, by C. H. Hooper; a Queen Termite, a "petrified" bird's nest, and other curiosities, by D. A. Hailes; wood colored green by a fungus (*Peziza Æruginosa*) by H. Reiss; cocoon of the Club-horned Bee, Snake's Eggs, Swift's Egg, Mummy Cat, Skin of the Redpole, "Bush String" (the sinews of the Kangaroo's tail), a drawing by F. E. Hulme, Esq., of a branched specimen of the Common Broom-Rape (*Orobanche minor*) and a Potato Plant with the tubers above ground.

A collection of 67 Indian birds' skins, presented by H. C. Spry, Esq., O.M., and a collection of Burmese butterflies and moths, presented by W. T. Roach, Esq, O.M., were on their way to Marlborough, but had not yet been received by the Society.

There were 72 persons present, 2 Honorary Members, 33 Members, and 37 visitors.

The minor field days, of which there have been six, were very successful. It is mainly owing to these that the great increase in our notices is to be attributed. The last one, on July 13th, was made to Woodborough, on the invitation of Rev. E. G. Wyld, the Rector, who pointed out the most favourable localities for Botanical and Geological work, and who kindly entertained the party to tea after the day's search.

ANTS.

For the last ten centuries, by all the nations of the ancient and modern World, no living creature has been so frequently taken as the type of industry, perseverance, systematic intelligence, and patriotism, as the ant. King Solomon in all his wisdom condescended to warn the slothful in his rhythmical sentences, "Go to the ant, thou sluggard, consider her ways and be wise, which having neither captain, overseer, or ruler, prepares her bread in the summer and gathers her food in the harvest;" the refined Virgil notes, though as subsequent discoverers have shown erroneously, its industry in robbing the corn-bins, when he speaks of the "Ant that feareth an old age of penury," and the gay Horace praises "the tiny ant of mighty toil, careful and wary of the future." Nor is it strange that modern naturalists have devoted a great part of their lives to the examination of its life—history and instincts; for when we read of their discoveries of the wonderful constitution of its little kingdom it seems rather like a fanciful fairy tale, than veritable sober fact. I hope that the expectations which these words must have raised high, will not be disappointed when you hear the habits and labours of these creatures narrated. We will begin by speaking of the ant itself, its place in the insect kingdom, and its dwelling.

Insects we know are divided into two main groups, namely, those that bite and those that suck; in the first the principal organs of the mouth are modified into a pair of sharp jaws, or mandibles; in the second those organs become a proboscis. To the Mandibulates, the first of these groups, belongs the order that includes the Bees, Wasps, and Hornets, the Sawflies, the Ichneumons, and the Ants: and to sub-divide further, the bees and wasps, and the ants are sharply marked off from the rest by one important character, their *social* habits: and the ants again are different from the bees, in that they build their dwellings under-ground.

This much dry technical detail has been necessary to give a clear notion of the place held by the ants in the Animal Kingdom; and we shall see that, low down as they appear to rank in the order of creation, few creatures have a more curious analogy in temper and habits to that animal, which is highest in the scale of being—Man. Now ants, like bees, are of three kinds, the males, the females, and the neuters or workers: of these, the males only live a short time after coming out of the Chrysalis; and the females, as well as they, have, at first, four large gauzy wings, which soon break off of their own accord, by a cross seam near the base; there are very few females in each nest, often only one, and their duty is merely to lay the eggs, in number

some four or five thousand, and be tended by the workers. These workers are by far the most important section of the community; in structure, they are only imperfectly developed females, and are much smaller than their fertile sisters; their jaws are much larger and sharper, and they never have any wings; they secrete a curious acid liquid, which they inject into the severe wounds made by their mandibles, of which the great Linnæus somewhat quaintly remarks, "is afforded a grateful juice by distillment of the ants." This is called formic acid, and can be prepared artificially by chemists, and curiously enough is the principal ingredient in the modern drug chloroform. It is recorded that the French have with characteristic culinary skill contrived to concoct a dish out of this, called *ant-ice-creams* or *crême aux-fourmis*, and the flavour is said to be like that of lemon juice. Upon the workers devolves the whole duty and labour of construction of the nest, providing of food, and the rearing of the young. There are enumerated by Linnæus more than seventy kinds of ants, known to him in the world; and of these about five inhabit the British Isles; each species builds its house in a slightly different way, but all on the same general plan. They collect a vast quantity of fragments of wood, straw, leaves, and all sorts of *débris*, and hollowing out a deep hole by their united efforts, bore below and construct countless galleries, passages, rooms, landings, and corridors, with beautifully proportioned pillars and the smoothest walls; then on the top they heap the refuse they have collected, and with incredible labour place above each of their hundreds of outlets a little door of some piece of wood or straw: when the rain comes on, they close up these doors, and then, with a wonderful adaptation of means to ends, begin to take earth and heighten the walls of the ant-hill by placing the earth on the top of the former walls; and the rain serves as it pours down to make the earth in the inner walls stick, and when the storm is over and the protection no longer needed, the water dries, the earth falls to dust again, and the hill resumes its original appearance. Besides the ordinary doors, they actually have masked doors, in case of emergency, guarded by one ant as sentinel at each. I cannot forbear quoting a passage from a modern writer on the immense strength and toil required for the myriads of little labourers to build up their complicated dwellings. He says "Compare the toil of an ant with that of a man and see how vast are the powers of so small a creature. Taking all the calculations in round numbers, and very much to the disadvantage of the ant, we find that a single man, who would have achieved a proportionate work in a single day must have acted as follows:—He must have excavated two parallel trenches, each 72-feet in length, and 4-feet 6-inches in depth; he must have made bricks from the clay he dug out, and with them built a wall along each side of the trenches, from two to three feet in height, and

fourteen or fifteen inches in thickness; and lastly, he must have gone over the whole of his work again, and smoothed the interior, until it was exactly true, straight, and level. All this must have been done without the least assistance, and the ground must be supposed to be filled with huge boulders, and covered with trees, timber, broken logs and other impediments."

I suppose that had the work, which was done in our Bathing Place this spring, been reduced in proportion to the relative toils of an ant and a man, it would have been performed by half a dozen ants in as many days, instead of by twenty workmen and a steam engine in half a dozen weeks.

Besides the labour of building and repairing the nests, the workers perform the duty of nurses: on fine sunny days, if you look at a large ant-hill, so covered with life, that, as Huber, the great historian of ants, graphically describes it, it looks like a *boiling liquid*, you may see the workers come out carrying in their mouths little white egg-shaped objects nearly as large as themselves; these are the larvæ, corresponding to the caterpillar stage of the moths and butterflies: these small balls, which Virgil not unnaturally mistook for grains of corn, the workers lay down in the sun and expose for awhile to heat to quicken their hatching; and when rain comes on and the sun goes in, they open the doors, hurry with their helpless burden down some long colonnade, and deposit it in a dark inner room, there to await its entrance into and emergence from the chrysalis; and as well as tending the babies, they are very affectionate to each other; they feed one another in turns, carry them on their backs, help them if wounded, and with caresses (actual caressss of their antennae and tongues) cheer them on to their work and shew their sympathy and affection.

They even act the part of doctors: out of a number of similar instances, I will quote this, an entomologist, who had torn the antennae or feelers from an ant by way of experiment, saw another ant come up to it and drop from its tongue some yellow liquid to stanch the bleeding wound.

In another domestic way the ant hill shows its likeness to a human community: it milks its own cows. All of us who have kept roses have too often seen, to our cost, on the stems and leaves of the rose bushes, tiny green objects, which eat the leaves and flowers, and which can only be got rid of either by a syringe, or by introducing a stock of Ladybirds into the garden, the larvæ of which will soon destroy them. These little Aphides, or plant lice, are the cows of the ants. The ants literally milk them. The process is somewhat as follows: The Aphides secrete, from the juices of trees they feed on, a kind of transparent sugary liquid, in a pouch on their bodies: when an ant is hungry, it approaches an Aphis, and with its antennae, pats very rapidly and softly the pouch on the Aphis' body, from which immediately issues a small drop of this honey-dew, which the ant immediately conveys to its

mouth, sometimes by means of the antennae, something like a Chinaman with chopsticks. After having exhausted an Aphis, he at once proceeds to another, and milks in this way ten or a dozen till his hunger is appeased. And not only do these ant cows as they are called afford their juice to their masters, but they do it with the utmost willingness: they are quite tame: they become domesticated always in the same ant hill, and absolutely refuse after a time to give their milk to an ant of another hill: in return for which loyalty the ants take great care to feed them well, and to treat them with the greatest delicacy: they carry them about in their mouths from place to place, though much larger than themselves: bear them into the ant-hill and give them as good food as their own young ones; and what is more, they build them little houses to protect them from the weather, from the intrusion of other ants, and from their numerous enemies. Huber records that in the case of a kind of Aphis which feeds on the thistle, the ants had bored a tunnel upwards from the ant-hill through the stem of the thistle, and at the top of the tunnel constructed a smooth dark room, used as a dairy, where the Aphides lived, and where they were secure from all intruders but the ants themselves: and in the winter, when the ants become torpid under the cold (they do *not* as the ancients believed, store up grain for winter consumption), the Aphides become torpid at the same time: and in the spring when the Aphides wake up and lay their eggs, the ants take care of the eggs and rear them as though they were their own.

Enough has now been said to show the strong domestic ties of interest and affection that exist between the ants themselves, and between themselves and the Aphides in their home life: we will now consider their military system. Ants, as well as other creatures, are obliged in the great struggle for existence, to fight; and this fighting generally takes place among themselves, and not with higher animals; and though all the million members of each ant-hill are on the best of terms with one another, yet the individuals of neighbouring hills are the most deadly enemies. They sally forth to meet one another in immense armies, and no words can describe the march and conflict so vividly as those of the great naturalist, who with his own eyes witnessed a severe combat between what he appropriately named the "Amazon" or "Legionary Ant," and another kind which he calls the "Negro Ant." He says at five in the evening, the Amazons leave their retreat, become restless, and assemble on the outside; they all move in a curved line: their number increases each moment: they describe greater circles: a signal is communicated, as they pass from one to the other, striking as they proceed with their antennæ and foreheads the breasts of their companions: these in their turn approach those advancing, and communicate the same signal: it is that of departure; the column becomes organised, advances in a straight line

over the turf, and removes to a considerable distance: there is no commander in chief: every ant is in turn first, seeking to be foremost, and a small number are constantly returning to the rear, by which means probably the movement of the whole army is governed." The close observation of Kirby has vividly described the actual conflict, which he compares to the battles between Rome and Carthage, and calls a Myrmidonomacthia. "The armies meet midway between their hills, and there join battle: thousands of champions of all the populations of these cities, equal in numbers to mighty empires, engage in single combat, and seize each other with their powerful jaws; a still greater number are engaged on both sides in taking prisoners: the spot where the battle most rages is about two or three square feet in dimensions; a penetrating odour exhales on all sides: numbers of ants are lying dead covered with venom; others composing groups and chains, are hooked together by their legs and jaws, and drag each other alternately in contrary directions: these groups are formed gradually: at first a pair of combatants grapple with each other, and mutually spirt their acid: then closing they fall and wrestle in the dust: if their strength be equal they remain there immoveable till those arrive to give either the advantage: sometimes both are succoured at the same time, and sometimes chains of six, eight, or ten, are all hooked together and struggle pertinaciously for the mastery: these combats last for days."

After hearing these stories of blood and courage, we are not astonished to hear that in another and similar point the ants are yet nearer to human beings. They keep slaves: they, like ourselves, have enslaved whole nations: but, unlike ourselves, treat them with humanity and consideration: these slaves are ants weaker than themselves: after one of the bloody combats just related they take their prisoners home, keep them there, prevent them from going back to their own hills, and make them do their work for them: sometimes instead of taking the adult ants prisoners, they march forth on a plundering expedition to a neighbouring hill of another or weaker kind of ant: storm it, carry off the larvæ or caterpillars, after a desperate resistance on the part of the besieged, and rear them up in their own nests to perform for them during life all their menial labours. These proceedings are just like the doings of the African slave dealers early in this century, who would go and burn down defenceless villages, carry off the young children, and bring them up under the lash in some American plantation. It is a well ascertained fact that these two kinds of ants do live frequently together in the same nest, the smaller and weaker being utterly subservient to the larger and stronger: and the only motive for this tyranny appears to be simple laziness on the part of the masters: they make the slaves mend the nest, feed them and their young as well, and even carry them about on

their backs: in return for which the slaves receive only houseroom in the nests of their conquerors: it may be noticed that the ants only make the neuters slaves, probably because they can get most work out of them, and also they do not wish for the trouble of rearing their slaves' young, but yet far from treating them at all cruelly, they rather respect them and honour them, than not; for without their slaves they would be quite helpless, for though active enough when fighting, they are the most slothful creatures possible at home: that is of course only those few particular kinds of ants that enslave others: most species are industrious enough.

We noticed above that when the ants set out on their march against a hostile camp, in the words of the quotation, "a signal was communicated as they passed from one to another, striking as they proceed with their antennae and foreheads the breasts of their comrades and so on; this signal was that of departure."

This brings us to one of their most curious and justly celebrated peculiarities, *they have a language;* it is certain they have an actual language; not a language of sounds, like ourselves, and like dogs and cats and other animals (who certainly can talk most plainly to us, if anything can, though not in words); nor yet a language of gestures like deaf and dumb people, who talk on their fingers, or signal posts; but a language of touch; and their organs of touch are the antennae or feelers, which stick out in front of their heads; when an ant wishes to be fed, it approaches another ant laden with food or Aphis, and begins to play very gently and swiftly with the soft silky antennae on the head of the other, which immediately yields the hungry one his dinner; when they wish to feed their young larvae, they tap their heads gently with the same organ, and te l them to open their mouths; and I believe when one ant greets another, after a long absence, they cross antennae, and wave them up and down repeatedly like Europeans shaking hands, or Negroes rubbing noses. And about these antennae, as to their office and nature, the wildest and most diverse themes have been formed; one learned philosopher asserts they are the seat of touch; another that of hearing; another "a kind of sixth sense," unknown to us, probably combining the powers of touch, hearing, and some sort of subtle nervous perception, which we cannot understand: this last supposition appears the most probable, but is very vague and unsatisfactory; but this much is certain that in the case of ants, at any rate, they are used for some kind of definite communication; but the subject is very obscure, and most careful scientific treatment yet is needed to establish any general laws.

There is an Eastern story often mentioned of the ant, which I ought to speak of; it is analogous, like many other Oriental tales, to one very familiar to our ears, that of Bruce and the spider: it is said that once when the great

Conqueror of Tartary, Timour, was flying from his enemies, he had to take shelter in an old broken down hut, and amused himself by watching the performance of an ant, which was trying to carry a grain of wheat up a pole; he counted the number of times it fell, and saw it drop the grain 69 times; at the seventieth it succeeded. The moral of this, namely, that perseverance is always successful, is so obvious, that one is tempted to think this story was invented for the occasion by Dr. Watts or Dr. Franklin; but at all events, if it is not true, it is well found, as the Italians say.

We have now tried to give a concise account of the nature, character, habits at home and abroad, intellectual, moral, social and physical qualities of ants; and I can only regret that I have not been enabled to consult the latest work on the subject; but we cannot but agree that if by many humans was shown as constantly all their good qualities of courage, protection, and self-sacrifice, we should be many steps nearer the Millennium. To wind up as customary and proper a paper by an appropriate poetical quotation, I will fittingly leave off with the words of the great poet, who did not disdain to take heed of the minutest creatures of the earth, as well as the "Ethereal Virtues," concerning the ant, or as he calls it

"The parsimonious emmet, provident
Of future, in small room large heart enclosed,
Pattern of just equality, perhaps,
Hereafter, joined in her popular tribes
Of Commonalty."

WINTER TERM, 1878.

MEETING HELD THURSDAY, OCTOBER 17TH, 1878.

The President commenced by announcing that the Committee had decided upon having only *one* Report yearly, and then exhibited the following donations:

Two Scientific Reports by the American Government.

A large mass of the Giant's Causeway by Capt. Atkins.

A collection of Sands and Fossils from Alum Bay, by A. Bowden-Smith.

The "Curiosites of Nature and Art," by W. M. H. Milner.

Elementary Botany, by Sir J. Hooker, by W. H. M. D'Urban.

A Roman tile, by H. D. Rolleston.

A flint arrowhead from Yorkshire, by B. Ford, Esq., (O.M.)

A Report of the Dulwich College Society, by the Society.

Canaries Eggs, by E. R. Berkeley.

Collection of shells from Tahiti and the Pacific, by E. R. Blackburne.

"Guide to Uriconium," by N. Masterman, Esq.

Various coins by members of the Society, in answer to an appeal by W. H. E. Worship.

A paper was then read by N. Masterman, Esq., on "*Uriconium*," which led to some remarks from T. O. Harding, Esq., on the absence of solid staircases in the ruins of old Roman towns.

The President announced that W. E. Mullins, Esq., had consented to preside over the Geological Section.

There were 36 persons present, 3 Honorary Members, 20 Members, and 13 visitors.

ROMAN REMAINS AT URICONIUM (SHROPSHIRE).

The old Roman town of Uriconium covered a large space of ground part of which is now occupied by the village of Wroxeter near Shrewsbury; and though it does not take long to see all the relics which have been brought to light, yet there is enough to excite a great deal of interest and to make one feel quite at home with the old Romans and their ways. I shall give you first a short account of the fate of Roman towns in Britain; then some description of the buildings which have been excavated; and lastly of the

relics preserved in the Museum of Shrewsbury. But I must say at starting that my paper is only a very short abstract of a most interesting little guide book to the ruins which I hope you will read for yourselves. I shall be happy to give a copy of it to the Museum, it is very small, well written, and well illustrated, and seems to throw quite a flood of light on the old state of things.

The Romans, we know, held possession of this island for 400 years, and I think we are apt to forget or overlook the length of this occupation, a period equal to that from the Norman conquest to Henry VII, or from Henry VII to the present time. We know enough of their wonderful civilisation, their engineering powers, and the vigour of their administration, to be sure that the towns which they built all over our island must have been solid and enduring works, worthy for their size and construction to be compared with many cities of modern times. There must have been splendid buildings public and private, temples, walls, and ramparts built with the same solidity and strength which has enabled them in other countries to stand the wear and tear of centuries, and our first feeling will be one of surprise at the almost total disappearance of all this ancient civilisation. Here and there the floor and part of the walls of a villa may be disinterred, a handful of coins or some bits of pottery unearthed and preserved in a Museum, little left below the ground and less above, scanty relics of such a long occupation and by such a race. Nor is the mere length of time which has elapsed sufficient to account for this wholesale destruction, though more than 1000 years has passed in the interval; for we have many relics of even earlier and ruder times.

It is interesting to trace the probable history of the decay of the ancient towns.

About the middle of the 5th century came all over Europe the great irruption of the barbarians, which destroyed the Roman Empire; the imperial legions were withdrawn from the distant provinces in a vain attempt to defend the Capital; and they left their subjects a defenceless prey to the wild tribes which overran and destroyed the civilisation like a great flood pouring over fertile lands. Britain at this time was covered with flourishing towns enjoying good municipal government and remarkable for their independent spirit and jealous rivalry to one another. But with their civilization the Romans had introduced an effeminate habit in the islanders who had once resisted them so boldly, a theory had grown up that the legions should defend the province and the towns defend themselves; the latter accustomed to look to Rome for help were powerless to save themselves; while their constant strife made it still more impossible for them to combine against a common enemy. It is probable that Uriconium and other

towns on the Welsh border perished in the period of confusion before the Saxon Conquest when the Britons made that piteous appeal to Rome called the Groans of the Britons—"The barbarians drive us into the sea; the sea drives us back on the barbarians and we have only the choice left us of perishing by the sword or by the waves."—After this the Saxons, either invited by the natives or induced by the defenceless state of the country began their gradual immigration which lasted for a century and a half, and during which these heathen savages seem to have taken a delight in destroying all the relics of a civilisation which they were quite unable to appreciate. On the capture of one of these towns whether by Picts or Saxons, the inhabitants were either massacred or seized as slaves; the more attractive articles were carried off as booty; and torches applied to the walls, the fire took effect on the woodwork, but the masonry was too strong to be destroyed by any hasty process, and for several centuries the town was left standing a mass of blackened walls much like the pictures one sees of Pompeii or Herculaneum.

Several causes now combined to preserve them from further injury. The population of the whole county was greatly reduced, the ruins became overgrown with shrubs and offered a shelter to wild beasts, the superstitious feelings of the Saxons peopled them with evil spirits and even throughout the middle ages it was the custom to mutilate any images or inscriptions that might be found, to destroy the charm they were supposed to possess. All kinds of strange legends grew up concerning the ruins, one of which is mentioned in the guide, probably referring to Uriconium. Meanwhile the floors and the lower parts of the walls became covered with a depth of several feet of soil, owing in the first instance to the rubbish which fell in when the town was destroyed; this was helped by the growth of vegetation and the particles of dust in the air were caught by the walls; how quickly a depth of soil will accumulate in this way has been proved in the case of the monasteries which were only destroyed in the reign of Henry VIII, yet their floors have been buried in some place to a considerable depth.

As late then as the 12th century, it seems that England was covered with the remains of Roman houses and villas, just as they are still to be seen in Africa. But a more destructive influence now began to work; by this time the Church had in some degree outgrown the former superstitions; the spell which had protected the ruins was broken, and they became the common quarries from which stones were taken for monasteries, churches, and buildings of all kinds; and traces of this are still to be found in many ancient walls, amongst others in the church at Wroxeter. All that stood above the ground was thus destroyed and cleared away, and we have left only what was below the surface which had been raised during the previous centuries,

namely, the walls to the height of 3 or 4 ft. and the original pavements strewn with the tiles of the roofing and other less perishable articles which fell in at the time of the original conflagration and became covered by this accumulation of soil.

But even this was not left undisturbed for a new form of superstition led to the belief in hidden treasures which were sought by digging, often with the help of a Magician to point out the right spot, and thus in many cases pavements as well as walls were broken up. A record in the case of Wroxeter mentions the arrest of certain persons who were found digging with this intent in the property of their feudal lord. A later cause of ruin and probably the most destructive of all was modern drainage and agricultural improvements, —the injury has been less at Uriconium than in other places, but even here only a small portion of the ruins can be left exposed as the site of the town covered a very wide area of valuable ground.

Of the *buildings* at Uriconium, the most striking and the only one which rises above the ground is the "*old wall*" a splendid piece of masonry 72 feet long, more than 20 high and three feet thick—and it seems strange that one relic should have been left of so great size where so much was destroyed— These *walls* were built in a very solid fashion, by raising facings of stone and filling the space between with rubble and hot cement which in course of time became even harder than the rest forming a sort of concrete, which when it gave way, fell off in blocks like solid rock. A peculiar feature in Roman walls and one which distinguishes them at once from other masonry is the habit of laying courses of red tiles which run along them in horizontal lines at intervals of a few feet—these tiles are about a foot square, and seem to have been used originally as "bonding-courses" to bind the masonry together —but the practice seems to have been kept up for ornament in many places where they would not answer this purpose as they do not always run through the whole thickness of the wall—In the same way we often see wooden beams running through the brick walls of cottages, a style which is supposed to date from the time when it was thought that brickwork would not stand without some such support, but which is still kept up in many parts of the country from its picturesque appearance.

It was close to this great wall that the most interesting discoveries were made. A space of two acres on one side of it is now exposed and contains many rooms which probably belonged to the *public baths* of the city—on the other side the foundations of a great building were unearthed which was decided to be the *basilica* or town-hall—(these town-halls were the models for the earliest mediæval churches)—this part of the ruin has since been covered again as the soil was rich and needed for the plough.

The *wall* in spite of its height and thickness was only one wall of a row of houses for we find that a regulation thickness of three feet was required even for partitions between the buildings—probably as a precaution against the spread of fires in these densely crowded streets.

The *rooms* were almost always on the ground-floor, as no traces of a staircase have ever been found in Britain, though some may have been reached by a ladder from without—several of the rooms had *pavements* either tesselated (that is, covered with small square stones set in cement and arranged in a pattern like mosaic work) or with small tiles fitted together in herring-bone fashion.

Some of the rooms were heated by the peculiar Roman arrangement—They are called *hypocausts* a Greek word meaning "heated from below" because fires were not lighted in the rooms but underneath them in the following manner. The floor of the room was of cement 8 inches thick and rested on pillars which raised it 3 feet or so above the ground—these pillars (of which 120 were found for one room), were made either of single stones (as at Chester) or more commonly of small square tiles placed one above the other. The space between the ground and the floor was heated by a furnace and there were often hollow tiles in the side walls to convey the hot air upwards and warm the room above. Ashes of coal and wood were found which had been used to light the furnace, and it was in one of these underground chambers that the most interesting of all the discoveries was made. I mentioned that this town, like so many others, was sacked and destroyed by barbarians, and of this many proofs were found,—in the promiscuous way in which articles of all kinds had been scattered about,—the discovery of five skeletons in one place,—that of a child in another,—and a great heap of human bones elsewhere, and this, though so small a part of the city, has been excavated; but the most remarkable case of all was that of *two women and a man* who had crept into one of these chambers under the floor for shelter; their skeletons were found lying at the furthest end where they had either been suffocated or buried alive by the falling ruins. "Near the old man lay a little heap of Roman coins, in such a manner as to show that they must have been contained in a confined receptacle, and a number of small iron nails scattered among them, with traces of decomposed wood, prove that this was a little box, or coffer. The remains of the wood are still attached to two or three of the coins. We are justified from all these circumstances in concluding that in the midst of the massacre of Roman Uriconium, these three persons—perhaps an old man and two terrified women—had sought to conceal themselves by creeping into the hypocaust; and perhaps they were suffocated there, or, when the house was delivered to the flames, the falling rubbish may have blocked up the outlet so as to make it impossible

for them to escape. It is not likely that they would have been followed into such a place as this hypocaust."

The *coins* in this case were 132 in number, made of copper and freshly cut, and, like most of the very large number found at Uriconium, were stamped with the heads of the Constantine family, showing that the town must have been destroyed at the latest period before the Saxon conquest; it is an interesting fact that the earliest Saxon coins were copied from those of this same family.

The *method of roofing* these houses is two-fold—some were covered with flat stones of long hexagonal shape fastened to woodwork like our slates by a nail passing through a hole in the upper end, and in some cases the nail was found in the hole. But the commoner and more ingenious plan was by means of large square tiles with the edges on two sides turned up or "flanged"—these were laid side by side with the flanged edges upward and a curved tile like a half pipe fitted over the joint and served the double purpose of connecting the flat tiles and protecting the crack between them. The same device is found in Saxon pictures. I do not know if it is common now, but I have since seen a house at Malvern roofed exactly in this way and it is said to be common in Yorkshire.

The *walls were plastered* internally with cement on which were paintings in fresco, the colours laid on when the cement was wet, and some at least were plastered on the outside as well and painted with stripes of red and yellow.

It seems almost certain that the rooms were *lighted by windows of glass*, a fact which had been doubted before these discoveries were made, for in course of the excavations great quantities of fine window glass were found strewn about the floors, which is too thick and flat to have been used for any other purpose, and it is strange to read in Hallam's "Middle Ages" that this use of glass (for windows) was rediscovered in the 14th century, while the Romans fully understood it so long before. I have here two bits of this material marked with the prismatic colours which are so fashionable now, and there are in the Shrewsbury Museum several specimens of bowls like a finger-glass and a decanter. The windows were perhaps usually sky-lights, as some of the rooms can have been lighted in no other way, but the walls are not high enough to show whether this was the case throughout.

I now come to the relics of articles found in the rooms, and of these the most interesting is *the pottery*. Five kinds have been discovered at Uriconium, and I am able to put before you specimens of each which were given to me by the keeper of the Museum.

1.—*The Samian* is the finest kind of ware, so called from its having been first made at Samos. It is beautifully glazed—like red sealing-wax in

colour, and generally ornamented with patterns and figures. It was also proverbial for brittleness and many of the specimens found at Uriconium had been broken and mended again with metal rivets. This ware was probably imported from the banks of the Rhine, where potteries have been found.

2 and 3.—Next we have *two kinds of local ware*, which are called Romano-Salopian, as they are both Roman, and both made in Shropshire. These are the most interesting to the antiquarian because they were first discovered here. They are very different in appearance, the one being white and made from what is called Broseley Clay; the other red, and much like the material of a common flowerpot. One of the red bits formed part of a mortarium, which was used for pounding grain and such things for cookery, and the inner side is covered with little bits of hard stone to help in the process.

4 and 5.—Lastly we have *two kinds of dark ware* (blue and black) which owes its colour to imperfect baking in what is called a "smother-kiln,"—the air being excluded, and the heat not powerful enough to bake the clay thoroughly, it retains enough carbonaceous matter to give it a dark colour. The bluer kind, marked *Upchurch Ware* is thick, rough, and strong, and came from a place in the Medway in Kent. The blacker is much more delicate, and was often ornamented by paintings laid on in white colour. It is marked *Durobrivian*, and was made at the potteries at Castor or Durobrivæ in Northampton.

Of articles for personal use. *Hairpins* were very common, mostly of bone, some of bronze. The Roman ladies rolled their hair into a knot behind the head, and thrust a pin through to keep it from falling down: the pins being three inches long and thickest in the middle to prevent them from slipping out. Some of them bore traces of having been saturated with oil which shows that fashion to have been in use. Several *fibulæ* or brooches to fasten the mantle were found. Also buttons, rings, bracelets, beads, keys, knives, needles, and combs.

The form of the *Roman hand-lamp* is well-known, being one of the commonest of Roman relics: it was like a small rather flat teapot with a spout at one end for the wick, and a handle at the other by which it was carried about as we carry a bedroom candle, and if the light was dim and the oil troublesome, still it must have been a handy little thing from its small size. It was of course necessary to have a supply of oil ready to keep it burning, which is alluded to in the parable of the ten virgins.

Other useful articles must be mentioned rapidly—such as two *mirrors* (specula) made of polished steel; an *artists' pallette*; a *steel-yard* and weights, marked with Roman numerals; *styli* or pointed instruments of bronze or iron, for writing on wax tables: spear-heads; a *strigil* or scraper; and part of an iron *horse-shoe*: the latter, if it were not rather doubtful,

would be of great interest, as it has been supposed that the art of shoeing horses was a later invention with which the Romans were not acquainted. We know from such words as "sonipes" and "cornipes" that one of the chief points in a horse was the firmness of his hoofs: and there have been letters in the newspapers a few weeks ago, attempting to persuade the present generation to drop the practise, which is said to injure rather than protect the hoof.

One of the most curious things was a *medicine-stamp* to be used for marking bottles or packets of a patent medicine called *dialebanum* or salve for the eyes, which organs seem to have often needed medical treatment in those days, whether from the defective light of oil-lamps or from other causes. Here is the inscription with the name of the old doctor and his drug, the capital letters being those on the stamp and the rest supplied to complete the words. "The most curious, however, of these miscellaneous objects is a medicine stamp, intended to mark packets or bottles of what, in modern times, would be called patent medicines. A certain number of these Roman medicine stamps have been found in Britain and on the Continent, and they are all, like this stamp, found at Wroxeter, for salves or washes for the eyes, diseases of the eyes having been apparently very common among the inhabitants of the western provinces of the Roman empire. The Wroxeter stamp intended for a collyrium or salve for the eyes, called *dialebanum* or *dialibanum*, gives us in all probability the name of a physician resident in Uriconium. The inscription may be read as follows, filling up the abbreviations :—TIB*erii* CL*audii* M*edici* DIALIB*anum* AD OMNE VIT*ium* O*culorum* EX OVO, *i.e.*, the dialebanum of Tiberius Claudius the physician, for all complaints of the eyes to be used with egg."

Of *animal remains* several are specially worthy of notice. I have said something about human bones above, but the most remarkable fact was the discovery of no less than eleven *mis-shapen skulls*. They are very long, and in some cases one eye is in advance of the other, and the whole face on a slant: at first it was supposed that they must have belonged to a family which enjoyed this unenviable deformity; but it has now been determined that the shape is due to the pressure of the earth aided by the action of certain acids which are always found in vegetable mould.

Oyster shells occur in great number, a product for which we know that Britain was famous. Also bones of the *wild boar*, *roe*, and *red-deer*, which have since become extinct in those parts at least of England; and what is still more interesting, the remains of two kinds of animal which have now ceased to exist in the world at all, and are only to be found in peat-bogs or caves. One is a kind of *elk* allied to the extinct Irish elk. The other, the

bos longifrons or long-faced ox, sometimes called the "Celtic short-horn,"* and named from the great length of the skull from the top of the head to the nose.

The skulls found at Uriconium bore the marks of a butcher's axe in the centre of the forehead.

* The regular cattle of Celts, supplanted by a new beast which came in with the Saxons, and surviving in small Welsh and Scotch breeds.

MEETING HELD THURSDAY, OCTOBER 24TH, 1878.

This was an extra meeting, held for the purpose of enabling G. H. Dawson, Esq., O.M., to give a discourse on "Field Sports, their morality, and their connection with the study of Natural History." This was followed by some remarks from the President and the Hon. Sec.

There were 43 persons present, 2 Honorary Members, 20 Members, and 21 visitors.

MEETING HELD THURSDAY, OCTOBER 31ST, 1878.

The President commenced by announcing the following donations:

Proceedings of the Watford N.H.S., vol. i, part 10, and vol. ii, part 1, by the Society.

Vol. x of the transactions of the New Zealand Institute, by the New Zealand Government.

Some pieces of the fungus (*Sclerodsrma vulgare*) were shown by Clayton, and a piece of Holly in flower, by E. G. Waddilove, and the President commented on the fact that the Rev. J. Sowerby had discovered nearly 300 plants in flower around Marlborough during the month.

H. M. Elder read a paper on Gallium, which was followed by some very interesting remarks and explanations by T. O. Harding, Esq.

The electrical apparatus made by H. M. Elder for the Stanton Prize, was exhibited and explained by G. F. Rodwell, Esq.

There were 49 persons present, 4 Honorary Members, 20 Members and 25 visitors.

GALLIUM.

On the 27th of August, 1875, M. Lecoq de Boisbaudran, a well known French Chemist, was examining the spectrum of a Zinc blende ore, that had been sent him by the Vielle Montagne Mining Company, from their works at Pierre-fitte, in the Valley of Argèles, Pyrenees. He noticed two new lines in the blue end of the spectrum, that he thought were well enough marked, to show the presence of a new element, which turned out to be *Gallium*.

It seems extraordinary at first sight that an instrument like the Spectroscope should be capable of detecting the presence of bodies in a mixture or compound; I will try and shew as shortly as I can how it is.

Every body has held a prism up to his eye, and has seen the rainbow colours that it shows, well, it is those rainbow colours that tell, in a spectroscope, of the composition of bodies. First, let us see what happens in the instrument. At one end is a narrow slit between two jaws, or knife edges of brass, which can be set to any required width by a screw at the side. Light passes through this to a lens, by which the rays are made parallel, and then to a prism, where it is refracted or bent aside by the glass, and if it is white light, it is broken up into a long stripe, containing, not white light, but all the colours of the rainbow from red to violet.

The light, after passing the prism, goes down a telescope on the other side, and is magnified by lenses, from which it passes to the eye-piece of the telescope.

The principle according to which a prism acts is not at all hard to master.

Imagine a line of men walking along on smooth ground, but obliquely towards some rougher ground. They will go straight on, keeping a straight line till the first man steps on the rough, but then he will have to take shorter steps, and if he takes the same number of steps will lag behind the rest a little and walk slower, and the line will be broken. By the time the whole line is on the rough, it will have turned a little and be marching in a direction inclined to the first, and the line will be found by the time it is across the rough, to have lagged a little behind the position it ought to have come out at.

Now suppose the line to be made up of men who are *not* keeping step, but some stepping shorter, and therefore faster than others, since they keep an unbroken line.

When these come to the rough ground, since each will have his step shortened by the same amount, those who step fastest will have the piece taken off oftenest, and wil lag furthest behind, and so when the line is on

the rough ground, it will no longer be an unbroken line but the men who step fast will be left behind those who step slowly.

White light is just like this line of men, the red rays being the slow stepping ones, the violet rays the quick stepping ones, so when white light goes into a glass prism, the violet is bent more to one side than the red, and comes out separated from the red.

In pure white light the streak that appears is perfectly continuous, but in lights of other colours parts are left out, and in some cases, where light is very pure, as when a flame is tinged with salt, a single narrow line of light is the result.

Every substance, when heated in the gaseous form, throws out a light that can be resolved into a spectrum, consisting of one or more bright lines of this sort.

For instance if a wire dipped in a solution of common salt (Sodium Chloride) be held in a spirit lamp flame, or Bunsen flame, a yellow colour appears, which on examination with the spectroscope, resolves itself into two brilliant yellow lines, so close that it requires a high power to separate them. A still better way, though, is to put a few drops of the solution of the substance to be examined in a small test tube, with a platinum wire fused through the bottom, and to pass an electric spark through it, by means of this wire and another which nearly touches the solution from above.

If the spectroscope be applied to this spark a very bright and well marked spectrum is seen.

Since every metal has its own peculiar set of bright lines, a skilful observer who knows these lines well, will at once notice any new one which appears in the field of view; and this is what M. Lecoq de Boisbaudran did. He saw two blue lines that he did not recognise, and so concluded that there was some new metal present in his tube; this new metal he called *Gallium* in honour of his country, and then set to work to hunt for it by chemical means.

Gallium is the fifth metal that has been discovered by this method.

Bunsen and Kirchoff head the list with *Caesium* and *Rubidium*, which they found in 1859. In 1857 Mr. Crookes found *Thallium*, and in 1863 Reich and Richter, *Indium*.

You may imagine the delicacy of this beautiful method of analysis, from the fact that $\frac{1}{2500000}$ (·0000004) of a grain of salt has been detected by it.

On December 6th, 1875, M. Wurtz laid the discovery of the metal Gallium before the Academie des Sciences at Paris, and exhibited a specimen weighing about $\frac{1}{7}$th of a grain.

This small quantity had been obtained by M. Lecoq de Boisbaudran himself, out of an immense quantity of blende, by isolating the *Sulphate of Gallium*, in a way I will explain presently, and decomposing it by electricity between two platinum plates, to do which he dissolved it in weak ammonia water. It took 5 hours and 40 minutes to deposit, and then was taken off the platinum by plunging the plate into cold water and bending it.

It was found to be a bluish white metal, not polished by rubbing, but if pressed by an agate burnisher, it took a metallic lustre, something like platinum or silver. Latterly the study and extraction of the metal has been taken up by M. Jungfleisch, the Professor of chemistry at the "Ecole centrale de Pharmacie" at Paris: and it was from him that I had this description of it, and its properties.

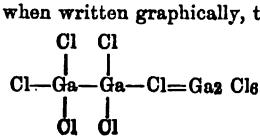
I went to the School and asked the porter if I could see or hear anything about *Gallium* there, as I had heard that it was there they extracted and studied it. He said that if I would go to their Laboratory, and see Prof. Jungfleisch, he would shew me the whole process. So I went, and, after waiting some twenty minutes, the Professor came in: I asked him if he would be so good as to show me his metal, whereupon he immediately offered to explain everything connected with it.

He told me first of some of its properties, which are very remarkable, as shewing it to be a connecting link between certain other metals; for instance, it is connected with zinc, by its atomic weight, which is 68, or very nearly equal to that of zinc, which is 65. Its salts too are white, another relation with zinc, for zinc salts are white. The density and atomicity, on the other hand, connect it with Aluminium and Indium by a relation fulfilled by its atomic weight as well.

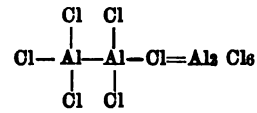
The atomicity of Gallium is what is called by Miller "pseudo-tetrad," which means that, in its power of combining with other bodies it may be written thus:—

Where the four arms mean, that it has the power of saturating the affinity of four atoms, or that it reaches out four hands with which to take hold of other bodies.

But yet on looking at the "empirical" formula of one of its compounds, it seems to only reach out three hands, for its Chloride is $Ga_2 Cl_6$, its oxide $Ga_2 O_3$, and the same with its other salts. But these shew the true tetrad form of the atom when written graphically, thus:—



Just like the chloride of Aluminium.



$$Cl-Al(Cl)-Al(Cl)-Cl = Al_2Cl_6$$

In consequence of this we shall see that it has the power of forming, and does form, an Alum.

The connection in Density, Specific Gravity, and Atomic weight will best be seen in a tabular form.

By Density or Specific Gravity of a substance is meant the relation of its weight to the weight of an equal bulk of water, thus if a cubic foot of any substance weighs, say, three times as much as a cubic foot of water, the *Density* of that substance is 3.

By Atomic weight is meant the weight of one atom of the body compared with one atom of Hydrogen.

The following table shews the relations of Gallium to Aluminium and Indium in Density and Atomic weight. In the third column is put the Arithmetic Mean, *i.e.*, half the sum of the numbers in the first two.

	Aluminium.	Indium.	Arith. Mean.	Gallium.
Density	2.6	7.4	5.0	4.7
Atomic Weight..	27.5	113.4	70.4	68

This numerical relation between bodies is one constantly found in chemistry, for instance, Lithium, Sodium, and Potassium, have their Atomic weights in Arithmetical Progression, thus :—

Lithium.	Potassium.	Arith. Mean.	Sodium.
7	39.1	23.05	23

M. Jungfleisch also showed me the process of extracting the metal, which is done in the following way:

The Galliferous Zinc blende is dissolved in "aqua regia," a mixture of nitric and hydrochloric acids, and sheet zinc is added till hydrogen stops coming off.

This expels from the solution all such impurities as Copper, Lead, Cadmium, Silver, Mercury, and Arsenic.

Then fresh Zinc is added, and the liquid boiled for several hours, causing a precipitate of oxide of Aluminium, mixed with subsalts of Zinc and Gallium.

This precipitate is dissolved in Hydrochloric acid and boiled with Zinc, to concentrate the Gallium in a small bulk of liquid, then acetate of ammonia is added, and sulphuretted hydrogen passed through, to precipitate the sulphides of Zinc and Gallium, and remove them from Aluminium. These sulphides are next dissolved in Hydrochloric acid, and precipitated fraction-

ally by carbonate of soda. This means that carbonate of soda is added slowly, and the first portions of the precipitate collected, since these contain all the Gallium.

The point at which to stop adding carbonate of soda is found out by testing the liquid as the operation goes on with a spectroscope.

To complete the separation from Zinc, this precipitated oxide is dissolved in Sulphuric acid, and Ammonia is added in excess, the solution s boiled to expel this excess, and the fractional precipitation repeated with carbonate of soda. And this last operation is repeated as often as is necessary to get the Gallium pure.

To procure the metal, the pure oxide thus separated is dissolved in potash, and decomposed by electricity between platinum electrodes.

With a steady and well regulated current, Gallium is deposited as a silvery, white, rough coating, on the platinum, from which, under water, bubbles of hydrogen come off, apparently from some Potassium deposited with the Gallium. The coating is covered with bright white points, which under a microscope turn out to be octahedral crystals. It can be detached, as I said above, by bending under cold water, when the bubbles of hydrogen appear.

The most remarkable of the properties of this metal is, the curiously low temperature at which it melts. If you take up a small piece, the heat of your hand is sufficient to melt it; it becomes liquid like quick-silver. This is the only example there is of a metal fusing below blood heat, except quick-silver; its fusing-point being exactly 29°5 Centigrade, or 85° Fahrenheit. When once melted, in virtue of a quality, called superfusion, it remains liquid, though it may be at a much lower temperature than 85°, as long as it is left alone; but if touched with a crystal of the solid metal it instantly solidifies, changing colour from the bright, white, silvery lustre it has when melted, to a slightly bluish tint.

This is not such an uncommon property as might be imagined, for even water may be cooled to within a few degrees of the Fahrenheit zero, *i.e.*, to about 28 degrees below freezing, without solidifying, if care be taken not to shake it, but if the least shake be given, it suddenly solidifies, the temperature rising from whatever it was before to 32° Fahrenheit.

The change of colour that I spoke of is very remarkable, and well deserves to be noticed, as, in fact, no one could help doing who saw it, for it becomes instantaneously, from a bright silvery white, a blueish colour like zinc or platinum.

The metal can easily be procured in splendid large crystals, by maintaining a small quantity at about the melting temperature, and suspending a

little piece in this on a platinum thread. These crystals are either octahedra or rhombic plates.

As for tests by which to recognise the metal, and its salts, M. Lecoq de Boisbandran and M. Jungfleisch give a good many, but none, I fancy, very distinctive.

They say that Gallium decomposes a mixture of water and hydrochloric acid, even in the cold, with evolution of Hydrogen, but the action is more intense with help of heat. The same exactly is done by Zinc.

The test of the spectroscope is, of course, the one that would always be used; but even this does not invariably answer, for it is found that if ferrocyanide of potash (K_4 Fe Cy$_6$) be added to a solution of mixed Zinc and Gallium salts, on examination with the spectroscope, the Zinc lines alone are visible.

This sort of thing has been noticed before in the case of other metals. Mitscherlich has lately found that in the presence of chloride of copper and ammonia the blue ray of strontium is quite invisible.

But if a dilute solution of the mixed chlorides of Gallium and Zinc be precipitated with Potassium ferrocyanide, and after washing in hydrochloric acid, be decomposed by Ammonium sulphide, the hydrochloric acid solution of these sulphides gives both the bright lines of Zinc and Gallium very distinctly.

The electric spectrum of Galluim, as seen in the glass tube with platinum points, is very distinct; it consists of two blue lines only, very well marked indeed, situated, one on each side of the Indium line, the one towards the red end of the spectrum being much more intense than the other. The lengths of the waves of light of which they consist are respectively; the brighter ·000,000,417 of a metre, (the French unit of length), and the other ·000,000,404; which is expressed by calling the lines 417 and 404.

The principal zinc lines are: one in the red, 636: one in the yellow, 591: and five in the green and blue, 492, 491, 480, 472, and 467. So, you see, there is no danger of mistaking the spectra of Zinc and Gallium for one another, like as the metals are, in other respects, and, though they are almost inseparable by chemical means, and certainly almost indistinguishable, yet the spectra will always tell if one or both are present, excepting in the case mentioned above.

The colour of the spark, that gives the electric spectrum of pure Gallium is a light violet; and, it may be noticed that as a rule a Gallium salt does not tinge a Bunsen flame at all, in fact according to Professor Jungfleisch the flame spectrum is perfectly invisible.

Of purely chemical tests for Gallium there really are none worthy of the name, they are all rather properties of its salts. They are:—

(1) From a solution of Gallium chloride or sulphate, ammonia will precipitate a hydrated oxide, but redissolve it in excess. The same happens to Zinc. If hydrochloric acid be added as well as ammonia, the precipitated oxide dissolves even more readily.

(2) The solution in ammonia is precipitated either hot or cold by acetic acid (vinegar). But if acetate of ammonia be used, neither the Chloride nor Sulphate of Gallium are precipitated till the mixture be boiled.

(3) M Jungfleisch writes to 'Nature' that the sulphate may be heated till nearly all the white fumes of sulphuric acid are given off, without losing its solubility in water; but what he means by this I cannot say, unless he is referring to a salt that I am going to describe, *i.e.*, the alum, or double sulphate of Gallium and ammonium, in which case the white fumes would be sulphate of ammonia, and the paragraph would simply mean that the dry sulphate is soluble in water.

(4) It is also soluble in alchol.

(5) The next property is one of the most interesting facts connected with the metal, I mean its power, that I mentioned above, of forming an alum.

Every one must recognise that alum has something to do with Aluminium in fact, that is the origin of its name. Common alum is a salt of Aluminium, a double sulphate of aluminium and potash which is represented by the formula

$$K_2\ Al_2\ 4(SO4)$$

But this is not the only alum; there are several more Aluminium alums, in which the place of potash is taken by another monad metal, as Sodium, or radical, as Ammonium (NH_4). Thus we have the Sodio Aluminic alum

$$Na_2\ Al_2\ 4(SO_4,)$$

or the Ammonic Aluminic Alum.

$$(NH_4)_2\ Al_2\ 4(SO4)$$

Then there are others formed on the same type, but in which other so called 'pseudo-tetrad' metals take the place of Aluminium, and with each other metal we can of course have as many alums as we can with Aluminium. I give three alums as examples to shew the type formation.

Chrome alum $K_2\ Cr_2\ 4(SO_4)$ Chromium for Aluminium.
Iron alum $K_2\ Fe_2\ 4(SO_4)$ Iron for Aluminium.
Manganese alum $K_2\ Mn_2\ 4(SO_4)$ Manganese for Aluminium.

To this class then belongs the Gallium alum, which is also an Ammonic alum, though no doubt the others may be formed. It is represented by:—

$$(NH_4)_2\ Ga_2\ (\quad)$$

This salt crystallizes like the other alums in cubes or octahedra, and if a crystal of it be placed in a strong solution of Ammonio Aluminic alum, it enlarges by causing the salt to crystallize on it.

The Gallic alum is soluble in cold water, but is decomposed by hot, the solution becoming cloudy, probably from the precipitation of the oxide of Gallium; but if Acetic acid be present with the hot water, no decomposition takes place.

The crystals have no action on polarized light.

Like the other alums, if excess of ammonia be added, part of the Gallium is precipitated as oxide, but part goes into solution.

(6). The next property to remark is one that again closely connects it with Zinc. A stongly acid solution of Gallium chloride is precipitated by ferrocyanide of potassium. This same ferrocyanide precipitates Zinc in precisely the same manner, as a white bulky precipitate, so that here there is no distinction between the two.

(7). When an ammoniacal solution of Gallium sulphate is decomposed between platinum electrodes, the Gallium is deposited on the negative electrode and a white film soluble in ammonia on the positive; which is, I think, the last property of the metal to be noticed.

As for its uses, it is as yet too rare to have any, but I may suggest one or two that it seems capable of fulfilling. First and foremost, of course, is medicine. Many rare metals find a place with the doctor, and there is no reason why Gallium should not. Then it has the power of clinging to glass and making a brighter mirror than the amalgam now used. Its low fusing point and non-volatility would make it fit for thermometers too, especially as it will not solidify at ordinary temperatures, owing to its property of superfusion.

Before closing this paper, I would recall to you that most peculiar and unexpected property of the metal, its extraordinary fusing point, so entirely unlooked for a fact in its history. It was almost foretold from numerical analogies that a metal would be found bearing those relations to Aluminium and Indium that I mentioned earlier to you; for throughout the annals of chemistry we are continually finding simple arithmetical relations between the various elements, and so generally does this happen that we are justified in expecting to find new elements, where between bodies alike in chemical properties no numerical relations exist to fill up and complete such relations.

No doubt Gallium is not to be the last of the discoveries the spectroscope is to make, and perhaps we shall some day see all the existing gaps filled up with its aid, while at the same time it is doing an immense work, literally, in other spheres.

In conclusion, I must render you my best thanks for your kind attention, and especially Mr. Rodwell for his kindness in allowing me to read the accounts

of Gallium in "Nature," in which I see that the present is not the last new metal, for an engineer in St. Petersburg, by name Sergius Kern, has discovered a metal in the platinum group, which he calls after Sir Humphry Davy, Davyum.

MEETING HELD NOVEMBER 14TH, 1878.

G. F. Rodwell, Esq., read a paper on "Iceland," illustrated by maps and drawings. Several Icelandic newspapers and utensils were also exhibited.

There were 96 persons present, 11 Honorary Members, 29 Members, and 56 visitors.

ICELAND.

DURING the present century more than fifty books have been written about Iceland, nearly half of them in our own language. From the magnificent series of monographs published at a price of £21, by order of the French Government, to the sketchy magazine article of last August; from Mackenzie's lordly volume with its copper plates, and hand-coloured illustrations, to Waller's plain "Six weeks in the Saddle," you will find every variety of literature connected with the subject. Iceland affords so many points of interest: the history of its people, and of their literature; its natural phenomena, and geology; the simple details of travel in such a remote and isolated country,—that we can scarcely be surprised at the amount of literary matter which it has furnished. Apparently now-a-days every second person who visits the island, thinks it his duty to write an account of "A Summer in Iceland," and as a result a good deal of utterly inaccurate matter has found its way into print. What with the Volsunga Saga, and Burnt Njala on the one hand, Bunsen's Memoir on Pa'agonite, and Johnstrup's description of the eruption of Askja, on the other, amalgamated with dissertations on the hydrography, climate, fauna and flora, agriculture, fisheries, statistics, education, and judicial procedure, the general result as far as I am concerned has been the accumulation of a mass of matter, which it will take some time even to digest, and a much longer time to put into anything like shape. Under these circumstances I am afraid the only thing I can do now will be to give you a very brief and desultory account of the chief characteristics of the country,

and then to read the Journal which I wrote day by day during a short journey into the interior.

Iceland is situated partly in the Eastern hemisphere, and partly in the Western. Ptolemy the most celebrated geographer of antiquity, placed the first meridian at the Fortunate Isles (now the Canaries), which he regarded as the confines of the habitable world. The Arabian geographers of the Middle Ages followed his example, and although when America was discovered, there was no longer any ground for the arrangement, it was retained by the greater number of writers because the meridian of Ferro, the most westerly of the Canaries Islands, conveniently divides the world into two hemispheres, leaving the whole of Greenland, and the two Americas in one hemisphere, and the world as known to the Ancients in the other. Of course the first meridian adopted by any country is quite arbitrary, but it is obvious that the world cannot be so conveniently divided into hemispheres by the meridians of Greenwich, Paris, Berlin, or Capo di Monte, as by that of Ferro, although the latter arrangements leaves more than half of Iceland in the Western hemisphere.

The shape of Iceland is that of a somewhat irregular oval, much indented on its Western side. A portion of the North-east coast enters the Arctic circle. It is distant about 200 miles from Greenland; somewhat more than 1200 miles from Marlborough. Its western coast is washed by the Gulf-stream which brings a good deal of drift wood to the island. Ice sometimes stretches in one continuous sheet between it and Greenland, and the spring is thus rendered very severe. At other times great masses of ice are carried down in spring to its northern coast, which is then unapproachable.

The area of Iceland (40,000 square miles) is five times greater than that of Sicily, and one-sixth greater than that of Ireland; while its entire population (72,000) is less than that of either Catania or Cork, which are third-rate cities in their respective countries. We cannot be surprised at the smallness of the population when we remember that the whole island is practically a vast desert with a coast fringe of inhabited country. Paijkull estimates the habitable portion at 4000 square miles:—one-tenth of the total area. Moreover we must bear in mind that thousands have perished by famine, disease, and convulsions of nature. In 1707, 16,000 persons were carried off by small pox; between 1753 and 1759 nearly 10,000 persons suffered death from famine, and the eruption of 1783 was followed by the death of nearly one-quarter of the population from disease and famine.

The capital of Iceland, Reykjavik, contains with suburbs 2500 inhabitants, while the village of second importance, Akureyri, is a collection of some fifty wooden houses on the shores of the Arctic ocean, containing nearly 1500 people. The rest of the inhabitants of the island live for the most part in

detached homesteads, containing from ten to thirty persons, who obtain a living either by fishing, or farming, or by both. Four-fifths of the inhabitants live by farming, that is by rearing sheep, and about one-tenth are fishermen. For more than three months in the year the country is cut off from communication with the rest of Europe. Letters arrive at uncertain intervals, and sometimes many weeks elapse between their arrival in Reykjavik, and final delivery in a remote part of the Island. Early in October I was told that the next mail would go out to Iceland on *November* 15, and this I believe is the last chance of communication till the beginning of March.

Iceland possesses neither roads, railways, nor telegraphs. There are no vehicles of any description, and all traffic and communication are effected by means of ponies. During the winter months the people remain shut up in their houses. There is no fuel in many parts of the island, and stoves are almost unknown. Turf is found in some localities, and is cut, stacked, and dried, as in Ireland. It is burnt in an open hearth, a hole in the roof serving for the chimney.

Crime is almost unknown. There is neither army, navy, volunteers, or police force. There are two lawyers, five doctors, and numerous Lutheran priests, each of whom serves from one to three Churches. There are 301 Churches, and 171 priests, or one to 456 of the population. The clergy hold all the best farms.

No grain of any kind will grow in the Island. Small patches of turnips and potatoes, which ripen in August, are cultivated in enclosures around the homesteads. The hay crop is gathered in August. There are no trees properly so called. At Akureyri two mountain-ashes are shown in a very sheltered position; they are carefully matted in winter, and are some five and twenty or thirty feet high. Occasionally one meets with a small extent of dwarf birch or willow from two to three feet in height, but this is an exception to the rule. Timber is imported from Norway, and the drift wood, which is cast upon the Southern and Western shores, is carefully collected. The food of the people is principally sun-dried fish, milk, curds called *skier*, and butter. The fish is so hard that it has to be beaten with stone mallets before it can be eaten. Black bread is sometimes procured; ordinary meat but rarely. We met with good cream everywhere, frequently with fresh trout and char, never (except in Reykjavik) with white bread. No metals are mined in the island, although Dr. Hjaltalin is convinced that iron was once profitably extracted, and that it might be now. Metals are so scarce in the interior, that we find some remnants both of a stone and bone age. We once met with bone skates, and several times saw the leg bones of sheep employed as part of the harness of ponies. Stone hammers are commonly used for beating dried stock-fish, preparatory to its appearance on the table.

The Island is very poor. There is no Bank, and very little money. The people have been unmercifully taxed by the Danes. Their principal fisheries have passed into the hands of the French. Of late years a large number of ponies have been exported to Scotland, and if the Sulphur Mines at Krisiuvek, and Myvatn are worked, it will bring a little money into the country.

In regard to the physical features of the Country it may be said that Iceland is a country of frost, and flood, and fire; of giant-glaciers, icy jokulls and lava covered deserts; of volcanoes, sulphur mountains, and hot mineral springs. Its scenery abounds with mountain torrents, waterfalls, ice scooped valleys, bold headlands, long tapering fiords; you pass over scores of miles of country where the only alternation is from a lava strewn plain, to a morass, and from a morass to a stretch of volcanic sand. The journey is diversified by rivers which have to be forded: hills which have to be climbed, morasses which need the most careful circumspection. Mountains with sharp serrated outlines are often seen near the horizon, and beyond them a stretch of ice covered plateau. Such scenery as this is bold and savage in character. The Danes have a proverb "God made the rest of the world, but the Devil made Iceland." Volcanic scenery is always penetrated by a spirit of weirdness, and desolation, which cannot exist in the midst of green fields and forest-clad hills. Bryce says that Iceland looks as if it had been made by itself, by chance, by the ungoverned action of natural causes, without any purpose to produce beauty. And indeed were it not for the wonderful colouring of the sky, it would possess but little beauty. The sunsets are often very beautiful, and the red reflections from lakes backed by purple mountains are very striking and picturesque. Moreover wherever there is snow the sky lends a colouring to the land, and an infinite variety of beautiful tints appear to illuminate the landscape.

When it rains unceasingly, when the wind blows a gale, and when the tops of the lowest mountains are obscured by thick leaden clouds, which seem to press upon the earth, then indeed Iceland is dreary and unpicturesque in the extreme.

But the people who inhabit this desolate region of frost and flood, who have suffered oppression in all its worst forms, misgovernment, war, pestilence, famine, earthquakes, have for a thousand years maintained a noble spirit of independence. They have preserved almost unaltered a language which is the parent of several languages of northern Europe, and a literature which has but few counterparts. A literature of Eddas and Sagas; of mythological poems, and semi-mythological prose histories. It has been said that "There is nothing besides the Bible and the poem of Homer itself which can compare in all its elements of greatness with the Edda." William Morris says of the

Volsunga Saga "this is the great story of the North, which should be to our race what the tale of Troy was to the Greek." Let it moreover be remembered that this literature was developed at a period when many of the surrounding nations were not only without a literature of their own, but had not even commenced to form one. Longfellow says "The Icelandic is as remarkable as the Anglo-Saxon for its abruptne s, its obscurity, and the boldness of its metaphors.....Poets are called *Songsmiths*, the rainbow the *Bridge of the Gods*; rivers the *Blood of the Valleys*, the earth *The vessel that floats on the Ages*, a ship the *Horse of the waves*." When winter came the poet bewailed the loss of the sun under the name of Balder the son of Odin, the Bright, and Bold, and Beautiful, beloved of Gods and man.

We set sail from Leith on Tuesday the 6th of August at 9 p.m. in the midst of a slight fog which increased as we left the mouth of the Firth, and compelled us to steam halfspeed all night. The morning of the 7th was hazy, and the sun was invisible all day, except for about five minutes at 1 p.m. When off Peterhead, and between 20 and 30 miles from shore we saw large numbers of fishing-smacks, which were hastening home. The night was so foggy that we were obliged to lie to. At 5 o'clock the next morning we were passing between Scotland, and the Orkney Islands, and were about 230 miles from Leith, having lost between 50 and 60 miles since starting, on account of the fog. The sunrise was bright, but the evening raw and chilly, and we had a fire in the cabin. Friday August 9th was a warm sunny day, and the sunset between 8 and 9 p.m., was magnificent. The direction of the sun was N N.W. A short broad rainbow was visible opposite to the sun. The setting sun left a good deal of light in the sky, and it was possible to read till past 10 p.m. A whale was seen in the distance. During the early morning of the 10th—our fourth day at sea—it was hazy, but it cleared about 7 a m., and the east coast of Iceland, near Berufjord, then became visible. Land was in sight all day. The vessel kept about 20 miles from the shore. At 6 p.m, while we were in the middle of dinner, the Captain came to tell us that we were passing Cape Langaness, and we ran on deck to find ourselves almost within a stone's throw of a fine bold, but not very lofty headland of crudely columnar basalt. Soon afterwards steering N. by W. we entered the Arctic Circle, remaining in it about 3 hours. About 7 p.m. we sighted a Grimsby fishing smack, which we hailed. The skipper came on board with some fresh fish for which we gave him some whisky. The sailors, twelve in number, had left England on June 15th, and intended to return about the end of September. The last piece of European news they had heard was that the Congress of Berlin had met. They had about 18000 cod on board, worth about £.00; but they complained bitterly of the season, and stated that they had sometimes caught twice as many fish with the same amount of labour. They had

undergone some very severe weather, and their small boat seemed quite inadequate to the rough work of the Arctic Seas. I thought then that I knew better than ever before what is meant by the "struggle for existence," and that the hardships and privations which these men had to undergo could only be a rapid means of securing the "survival of the fittest." About half-past seven we entered a fog bank, and our progress was very slow. The air was raw and cold.

At 8 a.m. on the following morning (Sunday, August 11th) we were within sight of Akureyri, the village of second importance in the island, situated at the end of the Eyjafjord. The air was mild, and heavy mists rested upon the hills, reaching nearly to the water's edge. We had been four and a half days at sea. There were a few Danish vessels in the harbour. The chief trade of the town is in shark-liver oil, which is used for tanning. A good many ponies are also exported. As soon as the anchor was down we landed, and went to the Church, a wooden structure with a basement of basaltic blocks. No one knew when the service would take place, but we were told that it would probably be about midday. On returning at that hour we heard incidently that there would be no service because the priest had to do duty elsewhere. A short distance from the town we came upon a homestead, the inhabitants of which brought us some milk, and allowed us to see the interior of their dwelling. All the houses in Iceland are alike, and the description of this may serve for all. The walls are of turf with layers of lava at intervals, they are usually four and sometimes six feet in thickness; they are roofed with growing turf laid on rafters and each of the principal rooms has a separate roof and a wooden gable end. On the south side are doors leading to the dwelling chambers, dairy, smithy, and outhouses. A long, low, dark, damp, passage leads to the principal rooms, and is usually terminated by the kitchen the only room in the house in which there is a fire; a miserable smouldering fire of damp turf, birchwood twigs, or fish-bones, burning on an open stone hearth; the smoke escapes through a hole in the roof. The rest of the house is without ventilation; the windows, if any exist, do not open. Twenty people sometimes eat and sleep in the largest apartment of the homestead, which shelters several families. Waller relates, that on one occasion he awoke in a state of semi-suffocation in a crowded room, and having at last made his host understand that he was slowly perishing for want of fresh air, the latter got up, and carefully withdrew a cork from a hole in the wall, and having held it in his hand for two or three minutes replaced it. Fortunately it was not once necessary for us to put ourselves in the way of a similar experience.

Plan of house—a. entrance passage

b. kitchen

c. fuel-room

d. store-room

e. large bedroom

f. small bed-room usually containing chests of clothes and linen, saddles, harness, and implements.

g. dairy

h. out-house for stores, containing the hand-mill, dried fish, &c.

i. smithy

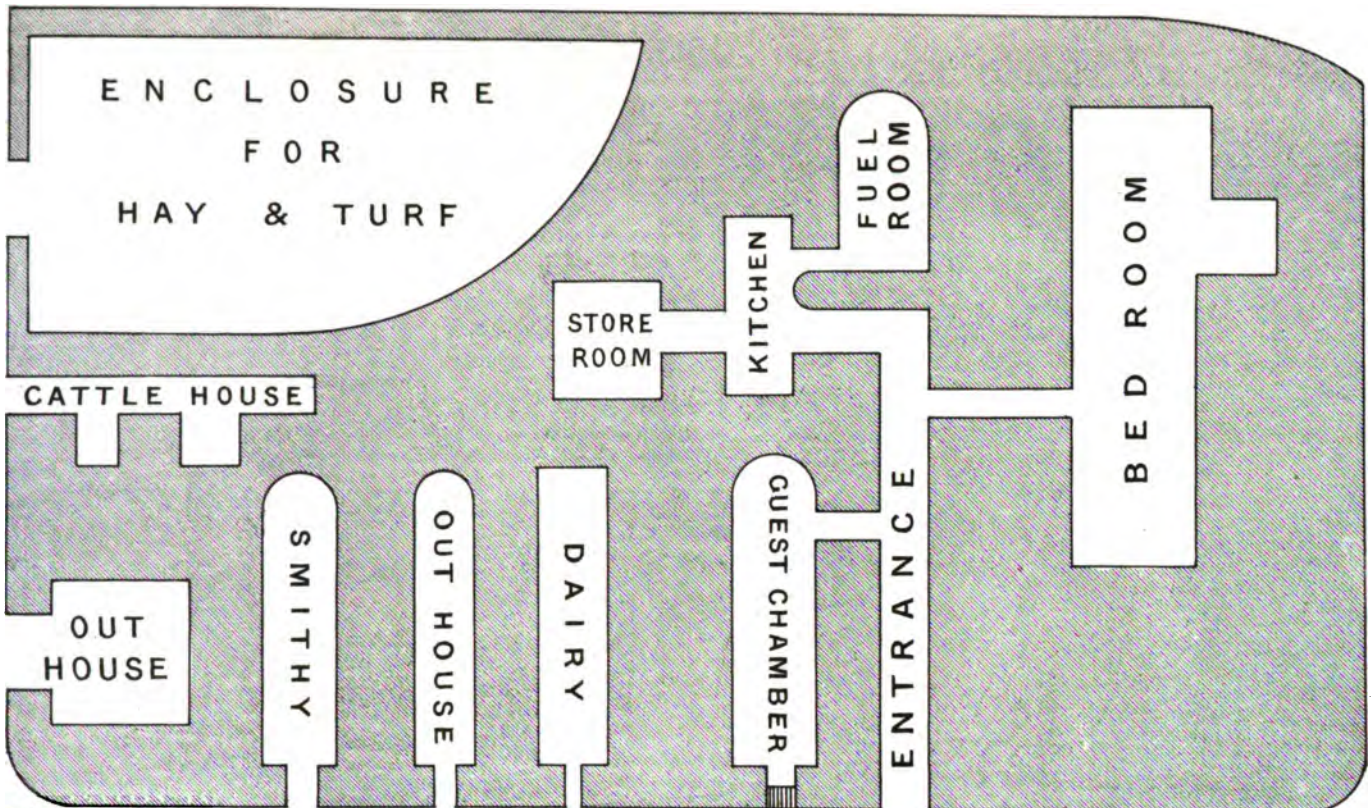
k. out-house for stores

l. house for cattle

m. an enclosure for hay and turf.

On Monday, Aug. 12th, we were compelled to remain at Akureyri, as a number of ponies were being shipped. We tried in vain to find anything of interest in the village in the morning, and later in the day hired some ponies and rode a long distance up the Eyjafjord, through a very hilly district strewn with lava blocks. Ponies were being shipped during a part of the night, and at 5 o'clock the next morning we steamed down the Fiord, and shaping our course to the west reached the North Cape, about 130 miles from Akureyri at 5.30 p.m. Somewhat to the west of it we saw a Glacier descending from the Dranga Jökull. The coast hereabouts is very fine; after passing Cape North we turned southwards, and passed several magnificent headlands of trap rock. Straumness particularly struck me: it was like a section of a gigantic crater, with sides almost sheer, while the unbroken side of it was continued back in the form of a lofty ridge. Not Fairhead in Antrim, Cape St. Vincent, the rock of Scylla, Cape Matapan, or even Gibraltar, impressed me so much as this vast record of past volcanic action. The sun set at 9 o'clock, but the night was very light, and it was possible to read on deck between 11 and 12 p.m.

At 8 o'clock on the morning of August 14th, we were off the Snæfells Jokûll, the summit of which had been visible four hours earlier but was now obscured by clouds. It is a mountain with two peaks, 4713 feet in height, and from the fact of its rising almost from the water's edge it is a very conspicuous object from a distance of many miles. The coast on each side of it is low. We steamed close to the shore and reached Reykjavik at 2 p.m. There was very little wind, the day was warm and sunny, and the sky deep blue. We found a few vessels in Reykjavik harbour. In the town itself there is but little to be seen. There are two streets, and a small square containing a statue of Thorvaldsen who was descended from Icelandic



Whiteman & Bass, *Litho to the Queen* 256 Holborn

parents, there is a small Cathedral, a Latin School containing 90 students; a small archæological Museum in the Cathedral, a public Library also in the Cathedral, numerous warehouses full of dried fish, and a few shops kept by Danes.

On the morning of Thursday, August 15th, we started at 10 a.m. for Thingvellir. The temperature in the shade at Reykjavik at 9 a.m. was 13°R.=61.25 Fah. Our cavalcade consisted of 34 ponies, a chief guide named Zöega, who had the management of the whole affair; four men to look after the ponies, unload the luggage, raise the tents, and so on; a cook without whom we should have been literally nowhere; and six of ourselves. We each had a spare pony, which we rode during the second half of the day's journey. Tents were already waiting for us at the Geysirs, and some additional stores at Hruni on the way to Hekla. The other ponies carried our baggage either in oblong boxes, or in waterproof bags; also provisions in the form of tinned meats, flour for bread, sugar, coffee, whisky, and so on. For a short distance we had a made road along which we scampered as fast as we could go; then the small river Laxa was forded, and we halted at 12.30 p.m. at Middalurge Farm to rest the ponies, and to lunch. They gave us some rye bread and butter, and capital coffee and cream. During the afternoon the road became very rough, and we passed through a country covered with masses of lava, forded a river a good many times, and finally entered upon a region of old moss-grown lava, which continued until we found ourselves on the brink of the Almannagjá—the great eastern volcanic rift at Thingvellir. Here we dismounted, and led our ponies down a steep causeway to the bottom of the valley, and then having forded the Oxará, we found ourselves at our quarters for the night—the Church at Thingvellir. Our journey terminated at 5.30 p.m The distance from Reykjavik is 24 geographical miles as the crow flies, and by the only available route 35 miles. We had pushed over some of the rough country at a pace which astonished all of us, some of it country across which you would not dare to take an English horse. The best sort of Iceland ponies are very sure footed and very fast; they climb like goats, swim swift and deep glacier rivers, pick their way over morasses, and gallop up hill, and down hill, and over stony grounds.

On our arrival, the priest of Thingvellir appeared and handed over to us the key of his Church. Churches are commonly used throughout Iceland as sleeping quarters; the library of the hamlet, and some of the priest's stores are often kept in them. The Thingvellir Church, which is larger than some which we afterwards saw, is a tarred wooden structure, having three windows on each side. It is 24 feet long, 15½ feet broad, and 7 feet high under the gallery (a mere loft), and 12 feet high in the rest of the building.

The wooden pulpit is dated 1683. It might contain 50 people. Two of us slept in the gallery, one in a hammock, and the rest on the floor; our beds were comfortable enough:—first a thick layer of new hay, then a waterproof sheet and a blanket, and a second blanket as a covering. Our dinner was cooked in the open air, over a fire constructed within a heap of stones. The cook, a black man who had been a ship's steward, proved a most handy fellow, wherever we might be he gave us capital soup for dinner, usually curry, and some kind of meat, and invariably good coffee and cream. Some of the best fritters I ever tasted were cooked over the forge fire of a smithy near Hekla; and some char which was caught in the Thingvellir lake was as delicately cooked as one could wish.

We spent the next day at Thingvellir:—a word which signifies the *Plains of the Council*, in allusion to the fact that the Iceland Parliament met here for several centuries. For some unaccountable reason most writers call the place Thingvalla—the genitive case.

It is declined:—N. Thingvellir
G. Thingvalla
D. Thingvöllum

The "American in Iceland," after acknowledging this, goes on throughout the whole of the chapter calling it Thingvalla.

The great volcanic chasm called the Almannagja is about 4 miles in length, and runs from the Thingvellir lake to Armannsfell, a parallel fissure called the Hrafnagja, 4 miles distant, runs along the other side of the valley, and the inclosed ground is more than 100 feet below the surrounding lava plains. The whole valley appears to have sunk during some volcanic eruption from Skaldbreid, a volcano in the vicinity. The "American in Iceland," after committing the most extraordinary errors as to distances, positions, and areas, speaks of Thingvellir as "the grandest and most awful scenery in Iceland, and probably unsurpassed in beauty, which may be called diabolic, anywhere on the globe." Burton says "This morning we spent in prospecting the humble wonders of Thingvellir."

The true estimate is probably to be found between these extremes. A man who has been all over the world like Burton, depreciates everything which is not very wonderful. A traveller who has ascended Chimborazo or Aconcagua calls Mont Blanc a mole hill, and the Rhine is a rivulet when compared with the Amazons or the Mississippi. The wonders of Thingvellir are to our mind by no means "humble," at the same time the scenery does not surpass that which one meets with, between Fairhead and the Giant's Causeway. In addition to the major volcanic chasms, the Almannagjá, and the Hrafnagya, the ground about Thingvellir is traversed in all directions by minor rifts, the result of the same volcanic action. These vary from 20 feet

across, to a few inches. The larger ones are often perpendicular and of great depth, and at the bottom is seen clear blue water, the product of some distant jökull. The Parliament of Iceland met for several hundred years at Thingvellir, on an oval raised space called the Logberg or Hill of Laws, surrounded on all sides by deep volcanic crevasses containing water.

Saturday, August 17th. Got up at half-past five, a warm sunny morning, walked towards the S.E. as far as the Thingvellir Lake, the largest mass of water in the Island, 15 miles long by 6 wide. The volcanic rifts could in many instances be traced as far as the lake, and the lava could be seen at the edges of the lake and beneath its surface in a crudely columnar form. It is believed by some writers that the sunk and fissured Thing Valley was produced by a great stream of lava from Skaldbreid, which hardened on the surface, while it continued to flow as in a kind of tunnel beneath, until a quantity of it found its way into the lake, and that afterwards when the supply from the Volcano ceased, the upper layers of the stream fell in and formed the present gigantic valley.

We breakfasted at 8.30, and started for the Geysirs at 9.40 a.m. The rest of the valley was very rough and our progress was slow. We crossed the middle crevasse called Háflagjá, and later on the eastern crevasse, the Hrafnagyá. Then we passed over a quantity of old lava, and at length at 12 15 p.m. halted in the Laugarvatn valley to rest the horses; after a short halt we again started, and reached a large farm on the shores of the Laugarvatn at 1.30 p.m. Several boiling alkaline geysirs were visible just below the farm house, at the edge of the lake, and dense clouds of steam arose from them. Hot springs were also visible on the other side of the lake. After luncheon, and a short rest, we made our way across a stream which flows into the Laugarvatn, and at 4 20 we reached the Brnárá River. Here we found a sort of rapids: the water was swiftly rushing over a bed of lava, and pouring down a deep volcanic crevasse in the middle of the river. Having crossed the shallow portion of the rapids we found a narrow bridge of wet planks, across the crevasse, over which the ponies readily passed. Hekla soon after came into view, and the western snow fonds were distinctly visible. Then we passed through some very bare country, between black volcanic hills devoid of vegetation, and after some very rapid riding we sighted Laugarfjall, then a tract of low spongy morass was traversed, a rivulet crossed, and the Laug Farm was directly above us. A few minutes later (6 p.m) we saw the steaming geysir fields, and the welcome sight of our tent with the Union Jack flying in the evening breeze. The total distance from Thingvellir as the crow flies is 26½ geographical miles, and by the necessary route no less than 40 statute miles,—a hard day's work over this rough country.

We found that our tent was pitched almost exactly where Mackenzie's tent was placed some sixty years ago, that is between the great geysir, and the new geysir called Strökkur. The tent was very comfortable; a thick layer of new hay was placed on the ground, waterproof rugs and blankets above the hay, and air-pillows for our heads. The cooking was done in the open air. There were four of us in a tent supposed to hold fourteen persons, so that we had plenty of room. Three smaller tents were pitched close at hand for the guides, and two of our companions.

After dining and resting for awhile, we turned out at 10 p.m. and began to cut sods to be thrown into the Strökkur when a sufficient number had been accumulated. The Strökkur is a geysir which can be irritated into violent action by the introduction of a quantity of sods, which block up the narrow pipe, and thus cause the steam to accumulate beneath them. The orifice is nine feet in diameter but it narrows to 11 inches, about 20 feet beneath the surface.

Having thrown in a quantity of sods, we waited till half-past 11, but the Strökkur refused to throw up its usual column of water. There was a good deal of light in the sky, and the bitterly cold wind which had greeted us on our arrival had gone down, but the air was excessively damp, and the geysir steam was condensing on the outside of our tent, so we turned in, and gave up all hopes of seeing the Strökkur till the next day. The large geysir was very quiet all this time, and its basin was full of water which gave off clouds of steams. During the night we heard peculiar dull noises beneath the earth, but no eruption took place from either geysir.

Sunday, August 18th, we dwelt in our tents pitched among the geysirs. It was a warm bright sunny day: Hekla was visible to the south east, across the valley of the Tungufliot. Strökkur still refused to go off, and the great geysir showed no signs of eruption. At 11.35 a.m. a quantity of sods, estimated at eight wheel-barrow's full were thrown into Strokkur; ten minutes later an eruption took place, and the sods were ejected churned into fine mud. The eruption at its best lasted for five minutes, but the geysir remained in a perturbed state for at least twenty minutes. The water was thrown to a height which I then estimated at 150 feet: this may be an over-estimate, for it is difficult to form an accurate idea of heights on a level plain, with nothing for comparison, but it was certainly more than 100 feet. A second eruption of Strokkur took place at 5 p.m. and a third somewhat later.

Around the Great Geysir there are more than twenty openings in the soil, some emitting steam, some full of boiling water, some containing boiling mud, red and yellow, some empty red pits formerly living geysirs. In the evening we cooked our dinner in one of these simmering Geysirs called

Blesi, which afterwards furnished boiling water ready to hand for our coffee.

On *Monday, August 8th*, our encampment at the Geysirs was broken up, and we started at 10.20 a m. for the hamlet of Hruni, on the way to Hekla. Our largest tent was left at a farm house near the Geysirs to be ready for us on our return. Here one of the party left us and went southward for seal-shooting, taking with him a guide, a small tent, and five ponies. On leaving the Geysirs we steered to the south-east, crossed a glacier river, then an expanse of morass, and then a lava field. Langijokull was seen to the north-east. At noon we reached the banks of the Hvita, a deep and broad glacier river flowing from the Hvitavatn a lake on the southern border of the Langjokull. We were ferried across; the ponies were driven into the water and after some hesitation one brave little beast took the lead, and breasted the rapid current. The others followed in a long diagonal. They were carried some distance down the river, but all landed safely in time, and immediately began to graze. After awhile we started again, passed through a rocky lava stream plain, and reached Hruni. Although the journey was not more than 15 miles we did not arrive at our destination till 4.20 p.m. Unsaddling and resaddling the ponies, the transference of the baggage to the boat, and all the arrangements in connection with the passage of the Hvita occupied a good deal of our time. At Hruni the pastor, Johannes Briehm welcomed us very heartily, and at once brought the key of the Church. In the evening we had a game of whist at the Rectory. The pastor looked on for awhile, but soon retired. Our guide Zöega a cultivated man, who spoke English fluently, played a fairly good rubber.

Tuesday, August 20th. We left Hruni the next morning at 9 o'clock, and having ridden for awhile along the valley of the Laxa, we came to the banks of the river, and found a very practicable ford. At noon we stopped at a farm on the banks of the Thjorsa, a broad and large river, taking its rise in the middle of Iceland. We crossed in a boat, while our 28 ponies formed a long line, and swam over in the usual manner. Then we bore to the west in order to visit the priest of Storuvellir Gudmundur Jonsson, who is an authority in regard to Hekla. He rode with us over several miles of his own glebe land, a volcanic plain covered with scant herbage, and bounded on the south by a great field of ancient lava, At 4.20 we arrived at the Galtalœkr Farm near the base of Hekla. Estimated distance from Hruni 25 miles. We put up two small tents near the farm house, but some of us preferred to sleep in the out houses of the farm. The summit of Hekla was enveloped in clouds, and the prospect for the morrow did not look very promising.

Wednesday, August 21st.—On February 27th last severe earthquakes were felt throughout the south-west portion of Iceland, particularly in the districts of Land, Rangarollir, Hreppa, and Fljotschlith, which are situated

immediately to the south and south-west of Mount Hekla. Between 8 and 9 p.m. an intense illumination of the sky, at first believed to be actual fire, was seen to the south-east. This was found to be due to the reflection by clouds of the light emitted by molten lava within a subsidiary crater, or *bocca del fuoco*, as the Italians would call it, of Hekla. On the following day dense columns of smoke ascended from the crater, and quantities of volcanic ashes fell in the districts of Hreppa and Biskupstundur. The light was seen at Reykjavik, nearly seventy miles distant, and there appeared to be two vents of fire.

One month after the eruption Prof. Tómas Hallgrimson visited the district and endeavoured to discover the exact position of the new crater. He found it in the Raúdaskal Valley, about four miles to the north-east of Hekla, and in connection with one of its outlying spurs. The chief crater was observed to be near the northern base of Krakatinkr, and a good deal of new lava was heaped around it. Herr Nielsens, a merchant of Eyrabakki, on the southern coast of Iceland, visited the scene of the eruption about the same time, and by ascending Krakatinkr he was able to look down into the new crater. He also determined its position, and traced the course of the new lava streams. The map which is here reproduced (for which I am indebted to Sjera Gudmundr Jonsson, the priest of Stóruvellir), is a copy of Nielsens' sketch made on the spot.

Two guides accompanied us, and we took a relay of ponies in case of accident or fatigue. We left the Galtalœkr farm (see the map, route *a a*) at 7.30 a.m., crossed a small streamlet, and soon came upon a growth of dwarf birch-trees from one to two feet in height. Here we put up a covey of very tame ptarmigan. On emerging from the underwood we entered a long level plain of volcanic sand and ash, extending between the river Thiorsa and the smaller stream called Vestri-Rángá. We cantered over the plain for about ten miles, turning aside for a moment to look at the falls of the Thiorsa, at the southern base of Búrfell. The substance of the plain is black volcanic sand and ash, with occasional white, grey, and red patches of pumice. At 9.15 a.m. we found ourselves near the termination of the Vestri-Rángá, and, bearing to the south-east, we forded the stream, and almost immediately afterwards came upon fields of volcanic ash and lava. The ground now became very rough, masses of lava were strewn in all directions, and there was of course no track. We passed several cones of ashes emitted by extinct craters, and presently saw in front of us Raúdaskal—the red mountain—a subsidiary cone probably thrown up in 1554. We wound along the Raudaskal valley, which is between six and seven miles in length and nearly two miles broad, passing by the base of several large cinder-cones. The new lava of 1878 was soon sighted, and we

parents, there is a small Cathedral, a Latin School containing 90 students; a small archæological Museum in the Cathedral, a public Library also in the Cathedral, numerous warehouses full of dried fish, and a few shops kept by Danes.

On the morning of Thursday, August 15th, we started at 10 a.m. for Thingvellir. The temperature in the shade at Reykjavik at 9 a.m. was 13°R.=61.25 Fah. Our cavalcade consisted of 34 ponies, a chief guide named Zöega, who had the management of the whole affair; four men to look after the ponies, unload the luggage, raise the tents, and so on; a cook without whom we should have been literally nowhere; and six of ourselves. We each had a spare pony, which we rode during the second half of the day's journey. Tents were already waiting for us at the Geysirs, and some additional stores at Hruni on the way to Hekla. The other ponies carried our baggage either in oblong boxes, or in waterproof bags; also provisions in the form of tinned meats, flour for bread, sugar, coffee, whisky, and so on. For a short distance we had a made road along which we scampered as fast as we could go; then the small river Laxa was forded, and we halted at 12.30 p.m. at Middalurge Farm to rest the ponies, and to lunch. They gave us some rye bread and butter, and capital coffee and cream. During the afternoon the road became very rough, and we passed through a country covered with masses of lava, forded a river a good many times, and finally entered upon a region of old moss-grown lava, which continued until we found ourselves on the brink of the Almannagjá—the great eastern volcanic rift at Thingvellir. Here we dismounted, and led our ponies down a steep causeway to the bottom of the valley, and then having forded the Oxará, we found ourselves at our quarters for the night—the Church at Thingvellir. Our journey terminated at 5.30 p.m The distance from Reykjavik is 24 geographical miles as the crow flies, and by the only available route 35 miles. We had pushed over some of the rough country at a pace which astonished all of us, some of it country across which you would not dare to take an English horse. The best sort of Iceland ponies are very sure footed and very fast; they climb like goats, swim swift and deep glacier rivers, pick their way over morasses, and gallop up hill, and down hill, and over stony grounds.

On our arrival, the priest of Thingvellir appeared and handed over to us the key of his Church. Churches are commonly used throughout Iceland as sleeping quarters; the library of the hamlet, and some of the priest's stores are often kept in them. The Thingvellir Church, which is larger than some which we afterwards saw, is a tarred wooden structure, having three windows on each side. It is 24 feet long, 15½ feet broad, and 7 feet high under the gallery (a mere loft), and 12 feet high in the rest of the building.

picked our way for about three miles between the edge of the field and the sloping sides of the cinder-cones. By the time we had ridden some 23 miles from Galtalœkr we found ourselves at the edge of a field of old lava, contiguous to the lava of 1878, and in sight of the largest of the new craters. The summit of Hekla was on our right, about four miles distant, and Krakatinkr was nearly facing us to the south. Here we left the ponies, tied head and tail together, to prevent straying during our absence. The only possible way to get nearer to the new crater was to clamber over the old bed of lava, which, although very rough and jagged, was not difficult to cross, on account of its covering of moss. At the edge of this bed we came upon a small tract of old snow, covered with volcanic ash to the depth of about eight inches. Then we reached the new lava and saw the largest cone of the new craters immediately in front of us, and about half-a-mile distant. The new lava was more rough and cindery, at least at the surface, than any I have ever seen around Etna or Vesuvius. Its surface was extremely jagged, and it was broken into ridges, and crests, and sharp pinnacles, which yielded uncertain support to the foot or hand. Hence it was both difficult and dangerous to cross, and we could only climb over a few dozen yards of it. Standing upon its surface we could see the cone of the largest of the new craters emitting small quantities of vapour and incrusted with red and yellow substances. The lava field extended both to our right and left, and in some places it was giving off vapour. The edge of the field along which we travelled was about twenty

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regard to Etna. But Hekla presents rather the appearance of a hog's back. Seen from the north or south it has a long oval outline, serrated by virtue of its three craters, and with an axis which passes from north-east to south-west. Thus the ends of the oval mass alone present the usual conical appearance of volcanoes. It is rather a line of craters than a single one; a volcanic rift elevated above the plain, with large *bocche del fuoco*. These rifts are common in all volcanic countries. In Iceland we have a notable example in Koetlagia, as we commonly call the volcano; in reality *Koetla-gja*—the Koetla rift, along the line of which various vents of fire exist. So again we have Almannagja, the great rift at Thingvellir. In the eruption of Etna, which took place in 1845, a large rift opened in the side of the mountain, and along the line of it no less than seven small craters opened. In the last eruption of Hekla fourteen small craters opened in a line. We have to distinguish between volcanoes terminated by one large crater, which always furnishes the vent when the eruption takes place from the summit, and volcanoes terminated by a line of craters, one or other of which may be active at any one time. To the former class belong Etna and Vesuvius, to the latter Hekla and Koetla-gja.

Apparently we cannot get out of the way of spelling Hekla *Hecla*. In one of our leading journals of October 11th I notice the spelling *Hecla*. Hekla means *hooded*, in allusion to the covering of snow, or of cloud, which so frequently rests upon its summit. *Hokull* signifies a chasuble in Icelandic. According to some writers Mount Pilatus, near Lucerne, takes its name from *Pileatus*, in allusion to its cloud-capped summit.—LETTER TO "NATURE."

feet in depth, but in some places it was piled to a much greater height. The lava was very close and compact some distance from the exterior; it was cracked and split in all directions. While incrustations of salt (*not* chloride of ammonium, which is common in some lavas) were often noticed at the points of fracture; also brilliant red and yellow incrustations, which are often mistaken for sulphur, but which in the case of this lava, at least, I have proved to be *sesquichloride of iron*. In some parts of the lava these incrustations covered many square yards, while fumes of hydrochloric acid were freely emitted in their vicinity. The sesquichloride when removed from the lava rapidly absorbed moisture from the air and formed an intensely acid solution. We left the neighbourhood of the new crater at 2.30 p.m, rested at 4 p.m. on the banks of the Vestri-Rángá, and reached Galtalœkr at 6.15 p m., having left it eleven hours before, and travelled over nearly fifty miles of volcanic country.

Two short accounts of the eruption have been published in Icelandic, the one by Prof. Hallgrimson, the other by Herr Nielsens. These have been translated for me by Herr Matthias Jockumsson, of Reykjavik, to whom I beg to express my acknowledgments. According to Hallgrimson there are fourteen small craters situated in a line passing from west-south-west to east-north-east, which line, if prolonged, would pass through the centre of the craters on the summit of Hekla. The distance between the extreme craters of February 27th is about 6,000 feet. The lava flowed more than a mile to the south of the largest of the new craters, but the main stream flowed to the north and north-east, and nearly reached the Mountain Valaknúkr.

Nielsens approached the scene of the eruption, a month after its commencement, from the north-west, and passing between Valafell and Valaknukr, he went due south to Krakatinkr, along the eastern edge of the new lava. From the summit of Krakatinkr he looked down into the principal crater, and saw that it opened towards the east, and that its sides were almost perpendicular. The lava within it was seen to be agitated by a wavy motion like the billows of the sea, and a stream of glowing lava was moving towards the south. A good deal of vapour was apparent, and loud noises, as of the roaring of the sea The valley is most steep, in a line which passes north-west and south-east from Raudfossafyall; here, consequently, was the greatest depth of lava. The stream varies from 10 to 100 feet in thickness, and in some places it has burrowed beneath the snow and ice. The lava is almost black in colour, and closely resembles the old Hekla lavas in texture; as it cooled it split up with great noise and commotion.

Nielsens again visited the neighbourhood of the new crater on June 9th. The lava had not increased in quantity since the beginning of April, but columns of vapour still arose from it, and small quantities of ashes and of

pumice had fallen during April and May. He crossed the warm lava and managed to ascend the largest crater, which was found to be 90 feet in depth and about 100 feet in circumference.*

Thursday, August 22nd.—The morning of the 22nd was very unpropitious; it rained hard, the clouds were low down on the mountains, and the air was cold and October like. We spent the morning at Galtalækr, and as the day wore on we began to fear that we should have to abandon our projected ascent of Hekla, and to return to England without having accomplished one of the main objects of our visit to Iceland. One of our party of five started off for the south coast in spite of the downpour. About noon the air began to clear, and at three o'clock I started for Storuvellir in order to see again and to copy Sira Jonsson's map of the scenery of the new eruption of February, 1878. At the same time two of the party started in the opposite direction, and in less than an hour and a half they brought down eight and a half brace of ptarmigan, with one gun. On returning from Storuvellir I saw a flock of at least sixty wild geese, but it was impossible to get near them. In the evening there was a magnificent silver sunset, seen over the mountains, to the N.W. of Hekla; the whole landscape was dotted in a silver glow. It rained most of the night.

Friday, August 23rd.—We left Galtalækr Farm at 9.40 a.m., taking with us G. Zöega, our guide from Reykjavik, together with the occupant of the Nœfholt Farm, on the flanks of Hekla. (Route *b b* on the map). Having crossed the Vestri-Rángá, we proceeded nearly due south, passed the Nœfholt Farm, near which we came upon the lava of 1845; and then passed over some very rough lava-strown ground covered with volcanic ash, which concealed holes into which the ponies sometimes stumbled and fell. The lava of 1845 is covered with the same moss which we noticed on the old lava near the crater of 1878, which causes it to look much older. When the ascent became greater, we left the ponies. Distance to foot of steep incline about seven miles from Galtalækr. Followed the southern boundary of the lava-field of 1845, until we reached a steep incline which we ascended. Crossed a small portion of the old lava field, then a tract covered with volcanic ashes, and finally found ourselves at the bottom of a steep slope covered with snow, beneath which water was heard rushing downwards. The ascent of this slope without alpenstocks was not easy. Several other snow slopes were crossed, and we then found ourselves near the crater of 1845—the most westerly of the four craters on the summit of Hekla. Above this we saw a crater with a red smoking mound within it; then in succession the third and fourth craters, and beyond the most easterly crater a nearly level snow-

* Extracted from "Nature."

covered waste full of lava blocks. From the most easterly extremity of this, which was reached at 2.30 p.m., we looked down upon the principal crater of 1878. The summit of Hekla is covered with much ash, sand, and red pumice, together with lavas of every degree of compactness, from the most vesicular up to obsidian. The descent over the snow-slopes was troublesome, on account of their steepness and the slipperiness of the snow, but we regained the spot at which we had left the ponies at 5 p.m.

Hekla was ascended for the first time in the year 1770. The difficulties of the ascent have been much exaggerated subsequently. Many travellers have made no attempt to scale the mountain. Even the "American in Iceland," who was in the neighbourhood of Hekla only three years ago, asserts that "the obstacles, real and imaginary, stated to be in the way, such as tortuous and difficult paths, swollen rivers, depth of snow, treacherous bogs, and the evident indisposition of the guides, perhaps from superstitious fears, to make the attempt, compelled us to turn our backs upon this snowy monarch of Iceland." Other writers speak of the "fearful precipices" and of places where "a slip would be to roll to destruction."

The fact is, it is quite an easy mountain to climb, in witness whereof I may mention the very abnormal conditions under which I ascended it. The day preceding our ascent had been extremely wet, and there was at least a possibility of a downpour on the day itself; moreover, there were streams to ford, and I had consequently put on waterproof wading stockings, and the usual accompaniment of thick iron-clad wading clogs, which, although the most cumbrous things in the world to walk in, are well suited for riding in the humid climate of Iceland. If the steepness and length of the ascent had required it, of course I should have left these encumbrances with the ponies, but it was quite unnecessary, and I accomplished the ascent without difficulty in this unwieldly equipment. Surely a mountain of this height was never before ascended in clogs and waders, and the fact of its being possible to do so without inconvenience, is a sufficient answer to those who would make the ascent of Hekla a dangerous and difficult feat.*

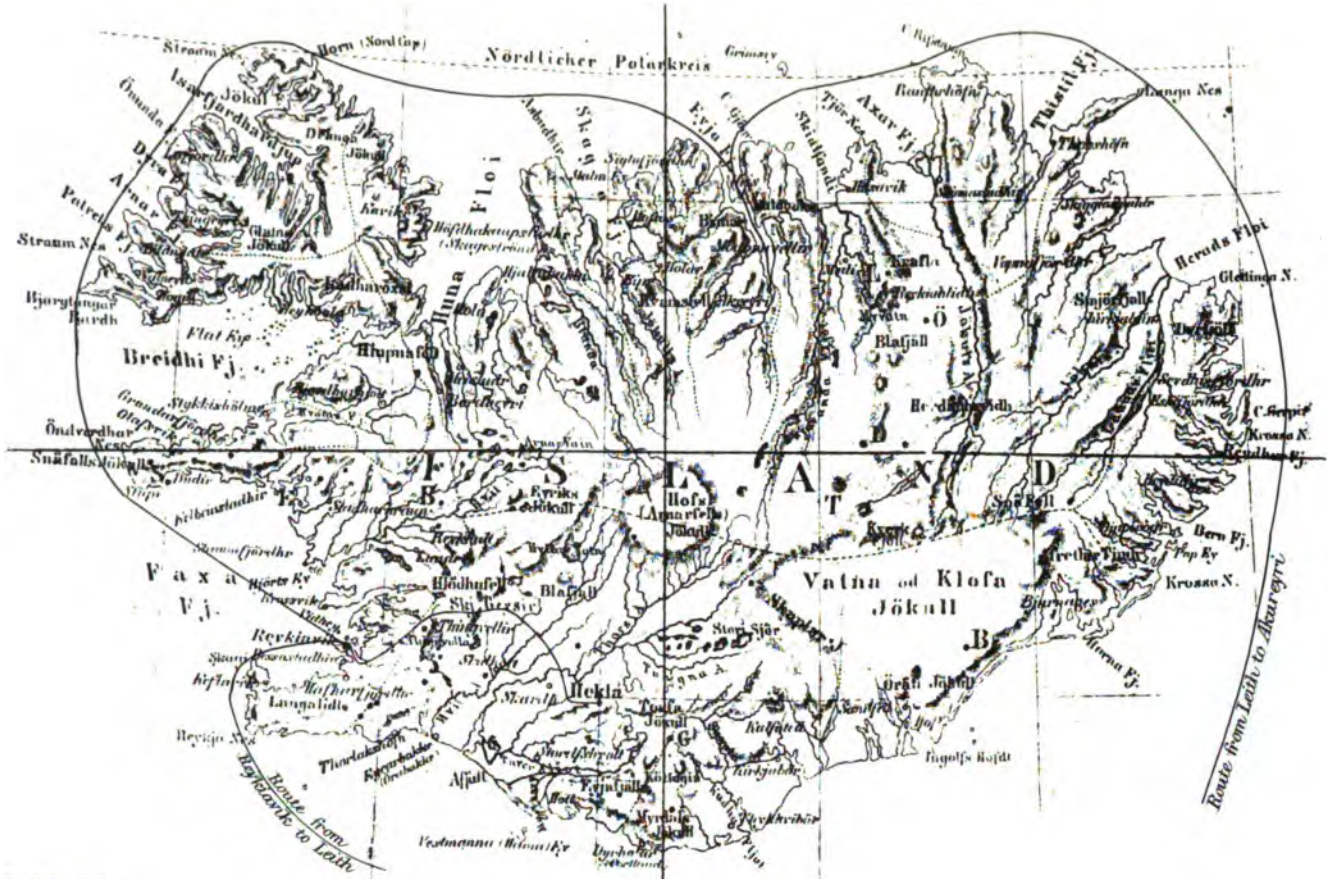
Saturday, August 24th.—This morning the Galtalækr encampament was broken up, and we started for Hruni at 10 a.m. It was cold, dull, and windy, and it rained heavily the whole day. We arrived at Hruni at 4 p.m.; of course there was no fire, and the Church was excessively cold and cheerless. We spent the evening at the Parsonage, and slept in the Church.

Sunday 25th.—Mild but cloudy morning, changing afterwards to a bright sunny day. We left Hruni for the Geysirs at 10 p.m., and arrived on the banks of the Hvita at 1 p.m., having previously passed through a fine rocky

* Extracted from "Nature."

gorge. The Hvita was crossed in the same manner as before mentioned, and when we got to the opposite bank, we rode for a few miles up the river to see the Gullfoss, where the whole river falls twice, the second time into a volcanic crevasse. We arrived at the Geysirs at 4.30 p.m.

On Monday we travelled to Thingvellir, stayed the night in the church, and started at 8 the next morning for Reykjavik, where we arrived at 3.30 p.m., having ridden nearly 300 miles since we had left the town a fortnight before. We found our vessel the "Cumbrae" in Reykjavik harbour, and we stayed till the following Friday, by which time 515 ponies had been shipped. On our return voyage we had perfectly calm weather, and we reached Leith in two hours less than four days from Reykjavik.



Wiemann & Bass, Photo Litho to the Queen.

MEETING HELD DEC. 5th, 1878.

The following donations were announced:—"Fragments of Local Legend and History of Wellington College," by the Author; Bulletin of the United States Survey of the Territories, by the U.S. Government, Vol. IV., No. 3; Hermit Crab, by E. C. Vincent.

W. H. E. Worship read a paper on Hops. It was professedly a short paper, written from actual observation, for the purpose of enabling a discussion to take place after it was read. An O.M, one of the original members of the Society, Rev. J. W. Parrington, had kindly come down to attend the meeting, and as his curacy was situated in the very midst of the Hop district, he was able to add some very interesting information. The following summary is drawn up from the Paper, and other remarks made during the discussion.

The great hop-growing country is Kent, but it is also cultivated to a great extent in Herefordshire and Sussex. Though indigenous to England, it grows elsewhere, and in many parts of Germany there are very large Hop Gardens. They are called Hop *Gardens* from the very great care required in the cultivation; not only has the ground to be dug over with a spade, and to be kept constantly clear of weeds, but it has to be very highly manured, the manures used being *sprats* and *old rags*. Of the former large quantities have to be carted for many miles, and being in a state of decomposition long before reaching the Hop Gardens, the odour is anything but pleasant. Unfortunately this kind of manure acts very injuriously in causing the destruction of an enormous number of fish of all kinds, for wherever they are plentiful the net is freely used; after taking out the larger fish for food, the smaller are not returned to the river, but are kept for the purpose of "adulterating" the sprats, and thus, as Mr. Frank Buckland says, the fisheries are very seriously injured. The *rags* are obtained from all sources, especially from the Hospitals, and are almost as offensive as the sprats. One field was observed to be manured with the chippings of seal-skin jackets. Another manure is that of the hop binds which after the hops are gathered is chopped up and spread on the land.

The Hop roots are planted in groups of three, about two yards apart, and the rows are kept so symmetrical that even when the hops are full grown you can see from end to end of the garden between the rows in all directions. For the first two years after a garden has been planted, the hops are always so poor that they are not worth picking, and it is not till the third year that the farmers find it worth while to undergo the cost of picking them. The first year they are hardly ever staked out; and in the second year they have comparatively small hop poles.

In the third year they reach their full maturity, and three hop poles are placed round each patch. These poles are about twelve foot high, and are stuck about ten inches into the ground, and the hops twine round them. As such large numbers of these poles are required, great care is taken to prevent them from rotting by boiling the ends in pitch. Large tracts of woodland are cut down in rotation every seven years to provide hop poles, and when the hop picking is over the poles are stacked in conical piles. It is a curious fact in the nature of hops that the binds will not twine round the poles both ways but always grow from right to left. If you try to force it to grow the other way by tying it back it will obstinately make great bends back, and if you persist in tying it the plant dies down for the year.

After all the care and expense spent in the cultivation of the hop, the profits are very doubtful. If the third season is wet or at all unfavourable to hops, the great majority of gardens will have very poor crops, though some particular gardens have never been known to fail bearing good crops, even in the worst of seasons. Besides damp, *wind* is very destructive to hops, a strong wind destroying the plants in a very short time, turning them all brown as if burnt; then again there are numerous insect enemies, the green fly, and the Hop Dog, being the worst. The first is a species of the common green *Aphis* which infests roses in the early part of summer; its enemy is the larva of the Lady-bird, which destroys enormous quantities, sucking their juices and leaving merely an empty shell. The *Hop Dog* is the caterpillar of the Pale Tussock Moth (*Dasychira Pudibunda*), a very pretty caterpillar with dense tufts of yellow hairs on the back, and a longer dull red tuft on the last segment of the body.

The most interesting part of hop cultivation is the picking season. Then the worst portion of the scum of London comes down into the country to take part in the picking, and to enjoy themselves at the same time. These wretches will pick most industriously during the day, and thus earn a great deal, while they commit endless damage during the night by poaching and trespassing. At this period of the year the by-lanes are quite unpleasant to walk in, as you are sure to meet a band of these drunken hop pickers, who have no regard for decency or morality. In many places the hop farmers refuse to employ any pickers except the village people in the neighbourhood, thereby preventing the place from being overrun by hop pickers from London, but as the season is very short in those parts where hops are cultivated most extensively, the picking cannot be done by the neighbours. In some places too *every* class of persons enjoys the pleasures of Hop-picking, even titled ladies, the profits derived from their labour being devoted to some charitable purpose. Great care is required in picking, as the hops must not be bruised; each hop is taken off separately by its stalk, so as not to touch the hop itself.

Slow as the process may appear at first sight, it is astonishing how rapidly they can be picked. Foremen are continually going round to examine the picked hops, and have to keep a very sharp look-out If the hops are very badly picked the farmer declines to pay the pickers.

There are several kinds of hops, which ripen at different times. The great aim of the farmer is to gather his hops the moment they are ripe, and hence when he has a large amount of hop garden, he plants different kinds of hops, so that as soon as one lot is gathered another may be in perfection.

During the season the hop garden is a very picturesque sight, the hop binds arch over and form pretty green avenues, which are removed one by one by the pole cutters. The pickers each take a bin, formed by two large stakes with a sack cloth suspended between them, and closed at the ends. These bins will hold about sixteen bushels. The pole cutters cut the binds about three feet from the ground, and then pull up the poles and distribute them to the pickers, who pick at a great pace. They are paid by the number of bushels they pick. In a good year when the hops are large, they generally get 1s. for eight or nine bushels, but in a bad season it is as much as five or six for a shilling. In this way a family can earn two or three pounds a week while the season lasts. The pickers have to commence at six in the morning, and go on till six or seven at night. They bring their food with them, and stay all day in all weathers. The picking is therefore a very arduous operation, as each bin has to take a certain number of poles, and must not be left vacant for a day. No leaves must be picked, and the hops should not be torn off and bruised, for then they are almost useless.

As soon as a sufficient quantity have been collected from the bins they are sent off to the kilns to dry. These kilns are great round brick towers, at the bottom of which is a large fire and above a partition the hops are spread out to dry. They stay there for a night till they are well steamed and then they are put into pockets. The pockets are big sacks about twice the size of an ordinary wheat sack. They are suspended to a round hole in the floor of the drying room and men get into them dragging as many hops as they can after them. These they tread down tight and bring down more and more till in the course of their treading they gradually rise to the top of the bag and the pocket is full. It is then fastened up and sent up to London or to some large hop factors.

The tithe on hop gardens is much heavier than on corn lands or pastures. In some parts of Kent it is four times as much, being about 16s. an acre, but, I cannot be sure if this rule prevails everywhere.

Hop growing is a great matter of speculation, even when the ground is carefully tilled, for if the third season is wet or at all unfavourable to hops, the great majority of gardens will have very poor crops. I have known,

however, particular gardens which have never failed to have a good crop in the worst of seasons. But these gardens can never continue more than three years in maturity, for after five years hop growing the soil becomes so used up that in the order of rotation of crops, it becomes necessary to change the produce.

Another great cause of hop growing being a losing affair is the competition with foreign hops. Till the last few years, they did not know how to dry their hops properly, and so sent them over to England to be kiln-dried, after having first dried them as well as they could. For though the *fresh* hops will be seriously damaged by pressure, when dried they may be packed as tightly as possible without suffering any injury. Latterly they have induced Englishmen to go over and show them how to kiln-dry the hops and as labour is so cheap there, they can send them to the English markets and undersell the English growers.

Labour is becoming scarce and this year a garden of no less than thirty acres was left unpicked, the farmer being utterly unable to procure the requisite labour.

One or two stories which prevail among the country folk are worth recording. They believe that a child who catches whooping cough never loses it until hop picking time, and on this principle I have known several village women who have made their little ones associate with children who had whooping cough about a month before the season comes on so as to get over the cough in the shortest possible time. I should think that fresh air, exercise, and merriment had a good deal more to do with the cure than the actual hop picking.

Another belief which the people have is that it will be a wet winter unless there are abundance of hop dogs in the garden.

After the paper an election was held to fill up the vacancy in the committee by the departure of Worship from the School. F. S. Alston was elected.

There were 27 persons present, 1 Hon. Member, 12 Members, and 14 Visitors.

ORNITHOLOGICAL NOTICES.

Names of those whose Initials occur in the following List:—

T.G.B.	T. G. Balfour.
P.A.B.	P. A. Butler.
G.P.C.	G. P. Campbell.
W.H.C.	W. H. Chappel
C.C.	C. Christopherson.
H.A.C.	H. A. Clark.
J.P.C.	J. P. Clarke.
W.C.	Mr. W. Coleman.
H.J.C.	H. J. Cooper.
E.M.R.C.	E. M. R. Cox,
G.E.D.	G. E. Dartnell, Esq.
P.D.	P. Dickinson.
A.B.F.	A. B. Fenwick.
J.J.H.	J. J. Hammond.
H.A.H.	H. A. Hartley.
T.L.K.	T. L. Kesteven.
N.M.	N. Masterman, Esq.
A.M.J.	A. Meyrick-Jones.
R.H.B.P.	R. H. B. Parnall.
C.E.P.C.	C. E. Pine-Coffin.
C.M.S.	C. M. Stephenson.
F.S.	F. Street.
G.C.S.	G. C. Swann.
L.C.R.T.	L. C. R. Thring.
J.S.T.	J. S. Trevelyan.

Sparrow Hawk—3 eggs, May 4, C.C.; 5 (hard set), May 11, J.S.T.

Tawny Owl—1 egg, May 18, (late), P.A.B.

Red-backed Shrike—eggs, May 9, A.B.F.

Spotted Flycatcher—eggs, May 20th, A.B.F.

Missel Thrush—4 eggs, May 9, H.R.H.; young flying, May 21, N.M.

Song Thrush—1 egg, May 3, F.S.; young flying, May 10, H.R.H.; eggs and young, June 8.

Blackbird—eggs, May 3, F.S.; young flying, May 11; 5 eggs, June 8.

Hedge Accentor—2 eggs, May 3, F.S.; young unfledged, June 8.

Redbreast—(1 egg, March 21, J.P.C.); young, May 1, P.A.B.; eggs, May 19, P.A.B.

Redstart—eggs, May 4, P.A.B.
Grasshopper Warbler—1 egg, May 9, A.B.F.
Sedge Warbler—2 eggs, May 18, W.H.C.
Reed Warbler—nest, June 8.
Nightingale—Before April 12, *Mrs. Booth*; heard May 1, T.G.B.
Blackcap—Eggs, May 12, A.B.F.
Garden Warbler—2 eggs, May 18; 1 egg, July 3, T.G.B.
Whitethroat—(3 eggs, March 21, J.P.C.); 2 eggs, May 13, T.L.K.
Lesser Whitethroat—Eggs, May 18, H.R.H.
Wood Warbler—Eggs, May 7, A.B.F.
Willow Warbler—Eggs, May 13, P.D.
Golden-crested Regulus—1 egg, May 11, H.R.H.
Greater Tit—8 eggs, May 3, L.C.R.T.; young unfledged, June 8.
Blue Tit—Eggs, May 4, P.A.B.
Cole Tit—7 eggs, May 2, E.M.R.C.; young, May 24, H.R.H.
Long-tailed Tit—Young, May 14, H.A.H.
Pied Wagtail—Eggs, May 19, H.A.C.
Meadow Pipit—Eggs, May 14, N.M.
Skylark—Eggs, May 12, A.B.F.
Wood Lark—3 eggs, July 2, P.A.B.
Black-headed Bunting—Eggs, May 9, A.B.F.
Yellow Bunting—Eggs, May 9, G.P.C.; 3 eggs, May 11, A.M.J.; young unfledged, June 8.
Chaffinch—Eggs, May 4, P.A.B.; young, May 24, H.R.H.
House Sparrow—Eggs, May 4, P.A.B.
Greenfinch—Eggs, May 4, C.J.T; young June 1.
Goldfinch—3 Eggs, May 11, H.R.H.
Linnet—2 eggs, May 10, H.R.H.; young unfledged, June 1.
Lesser Redpole—1 egg, May 8, A.B.F.
Starling—Young, March 2, J.J.H.; young flying, June 1; white var., shot at Grafton, June 9, W.C.
Carrion Crow—4 eggs (fresh), May 4, T.G.B.
Rook—Congregating, Feb. 10; building March 4; 5 eggs, March 23, H.J.C.; young, May 18.
Jackdaw—5 eggs, May 8, H.R.H.
Magpie—7 eggs (4 or 5 nests), May 2, R.H.B.P.; young, March 11, T.L.K.
Jay—2 eggs, May 11, T.L.K.; eggs, young flying and young unfledged, June 8.
Green Woodpecker—1 egg, May 10, C.M.S.
Creeper—3 eggs, May 8, C.M.S.
Wren—3 eggs, May 10, H.R.H; young, May 25, H.R.H.

Nuthatch—Eggs, May 9, A.B.F.

Cuckoo—Heard Ap. 20, *Mrs. Booth*; egg in Reed Warbler's nest, June 8, G.C.S.

Swallow—Seen before Ap. 12, *Mrs. Booth*; congregating Oct. 27; seen up to Nov., W.C.

Martin—Seen Ap. 12, F.S.; building, May 18; nest June 1; seen with the Swallows to Nov, W.C.

Sand Martin—Seen Ap. 9, A.B.F.; egg, May 18.

Swift—Seen (Bedwyn), May 1, T.G.B; (Marlborough), May 3, T.G.B.

Goatsucker—2 eggs, last week in June, G.E.D.; one shot at Mildenhall, Sept. 10, W.C.

Ring Dove—1 egg, May 10, H.R.H.; 2 young unfledged, May 11, T.L.K.; 2 eggs, hard set, June 26.

Stock Dove—2 eggs, March 21, H.R.H.; 2 eggs (v. hard set), June 26, T.G.B.

Turtle Dove—Seen May 15, H.R.H; eggs, June 2, C.E.P.C.

Red-legged Partridge—6 caught in Jan.; one shot at Mildenhall, Sept. 10, W.C.

Peewit—Eggs May 4, A.B.F.

Land Rail—Heard May 11; 8 eggs, July 2, A.B.F.

Moorhen—6 eggs May 7, H.R.H.; young off nest, May 11, W.H.C.

Coot—Young off nest, May 11, W.H.C.

Wild Duck—Young off nest, May 11, W H.C.

Little Grebe—Eggs May 4, P.A.B.; 5 eggs, May 7, H.R.H.; young, May 18, W.H C.

Swan—Young, just hatched, May 11.

Curlew—Killed at Monkton Downs, near Avebury, Ap. 28, W.C.

Sandpiper—Seen May 11, W.H.C.

Woodcock—Seen Oct. 19, at New Mill, *S. B. Dixon, Esq.* This is the earliest recorded instance of its appearance.

ENTOMOLOGICAL NOTICES.

The following notices are chiefly due to the kindness of N. Manders, Esq., where they have been obtained by others, initials are added.

The following are the initials of the captors:—

F. S. Alston	F.S.A.
O. Elton	O.E.
S. Pearse	S.P.
D. A. Hailes	D.A.H.
E. R. I. Blackburne	E.R.I.B.
F. Street	F.S.
C. M. Stephenson	C.M.S.
W. W. Boulton	W.W.B.
S. B. Wilson	S.B.W.
G. A. Berkeley	G.A.B.
G. H. Elin	G.H.E.

RHOPALOCERA.

G. Rhamni—Mar. 3, Sep. 6
P. Brassicae—Ap. 16
P. Rapae—Ap. 7, O.E.
P. Napi—Ap. 4, F.S.A.
A. Cardamines—May 2, S.B.W.
C. Edusa—June 7
A. Galathea—July 5, G.H.E.
L. Egeria—Ap. 27—F.S.
L. Megaera—May 5
H. Semele—Aug. 5
H. Euphrosyne—May 30
H. Janira—May 11, O.E.
C. Pamphilus—June 3, C.M.S.
L. Sybilla—July —, Mr. Coleman
C. Cardui—May 9, F.S A.
V. Atalanta—July 9
V. Io—Ap. 18, F.S.
V. Polychloros—Aug. 8
V. Urticae—Feb. 10
A. Aglaia—May 27, W.W.B.
A. Semele—June 3, C.M.S.
A. Euphrosyne—May 30
N. Lucina—May 30
T. W-album—Jy. 13
T. Quercus—Jy. 31
T. Rubi—seen May 5, F.S A.
P. Argiolus—May 18
P. Alsus—June 1
P. Corydon—Jy. 20
P. Alexis—May 18, F.S.A.
P. Agestis—Aug. 2
T. Alveolus—May 18
T. Tages—May 28, C.M.S.
P. Linea—Jy. 27
P. Sylvanus—May 15, F.S.A.

SPHINGINA.

P. Geryon—Jn. 6, S.P.
A. Filipendulae—May 18, E.R I.B.
S. Ocellatus—June 19, S.P.
S. Populi—May 9
S. Tiliae—May 10, D.A.H.
A. Atropos—May 3, Miss Merriman
„ larva—Sep. 20, Mr. Crow
C. Porcellus—May 28, S.P.
M. Stellatarum—Jy. 7

BOMBYCINA.

C. Ligniperda (larva)—Sep. 10
H. Hectus, June 21
H. Lupulinus—May 14
H. Humuli—June 14
H. Sylvinus—Jy. 30
C. Bifida—June 6
C. Vinula—June 5
D. Caeruleocephhala (bred)—Sep. 22
P. Bucephala—June 20, S.P.
D. Pudibunda—June 8
O. Antiqua—Jy. 23
S. Salicis—Jy. 7, S.P.
P. Auriflua—Jy. 19
L. Aureola—May 11, F.S.A.
A. Caja—Jy. 22
S. Menthastri—May 9
S. Lubricepeda—May 20, S.P, G.A.B.
D. Mendica—May 25
C. Jacobeae—June 6
L. Quercus, larva—May 5, F.S.A.
O. Potatoria—June 27
G. Quercifolia, larva—June —, S.P.
D. Falcula—May 22

NOCTUINA.

B. Perla—Jy. 18
A. Aceris—Jy. 8, D A.H.
L. Turca—June 21
L. Lithargyria—Jy. 7
L. Impura—Jy. 8
L. Pallens—Jy. 4, S.P.
X. Rurea—June 14, S.P.
X. Lithoxylea—Jy. 22
X. Sublustris—Jy. 22
X. Polyodon—June 26, S.P.
N. Saponariae—June 16, S.P.
C. Cytherea—Aug. 5
M. Anceps—June 11
M. Brassicae—June 14
A. Unanimis—June 11
A. Oculea—Aug. 5
M. Strigilis—June 10, S P.
M. Fasciuncula—June 11
M. Arcuosa—Jy. 6
G. Trilinea—June 10
C. Alsines—Jy. 29
C. Cubicularis—Aug. 28
R. Tenebrosa—June 21
A. Exclamationis—June 21
T. Fimbria—Jy. 29, Mrs. Hulme
T. Janthina—Jy. 8, F.S.A.
T. Orbona—Aug. 8
T. Pronuba—Jy. 1, S.P.
N. Plecta—June 21
N. Rhomboidea—Aug. 5
N. Brunnea—Jy. 6
N. Festiva—June 21
T. Gothica—Mar. 19
T. Rubricosa—Ap. 12
T. Instabilis—Ap. 11
T. Stabilis—Ap. 11
T. Munda—Ap. 11
T. Cruda—Ap. 6
C. Vaccinii—May 12, O.E.
C. Trapezina—Aug. 5
C. Diffinis—Aug. 20
E. Lutulenta—June 10
A. Nebulosa—Jy. 7
H. Dentina—June 8
H. Oleracea—Jy. 19
H. Pisi—June 16
B. Parthenias—Ap. 4
B. Notha—Mar. 16
A. Triplasia—Jy. 22
P. Chrysitis—Jy. 19
P. Iota—Jy. 8
P. Gamma—May 25, F.S.A.
A. Pyramidea—Aug. 5.
M. Maura—Aug. 15
E. Glyphica—May 10, F.S.A.
P. Aenea—June 19

GEOMETRINA.

O. Sambucata—Jy. 8
E. Apiciaria—Jy. 19
R. Cratægata—May 18
S. Illunaria—Ap. 18
O. Bidentata—May 20, D.A.H.
C. Elinguaria—Aug. 15
E. Tiliaria—Aug. 21
E. Erosaria—Aug. 20
A. Prodromaria—Feb. 23
B. Rhomboidaria—Jy. 13
P. Cytisaria—Aug. 5
I. Lactearia—May 30
H. Thymiaria—Jy. 23
A. Scutulata—Jy. 22
A. Trigeminata—Jy. 10
A. Remutata—May 30
C. Pusaria—May 30
C. Exanthemaria—May 30
C. Temerata—May 18, S.P.
C. Taminata—May 18
H. Wavaria—Jy. 23
S. Clathrata—May 18, E.R I.B.
P. Petraria—May 18, S.P.
A. Grossulariata—Jy. 11
L. Adustata—June 1
L. Marginata—May 30
H. Rupicapraria—Feb. 15
H. Progemmaria—Feb. 20
L Didymata—Jy. 10
L. Multistrigaria—Mar. 19
L. Olivata—May 22
L. Miata—May 18, D.A.H.
E. Affinitata—June 8
E Centauriata—May 22
E. Plumbeolata—May 22
E. Castigata—May 4
E. Vulgata—May 3
E. Abbreviata—May 16
T. Variata—Jy. 5
H. Elutata—Aug. 6
M. Hastata—June 19
M. Rivata—May 15
M. Biriviata—May 11
M. Fluctuata—Ap. 11
A. Badiata—May 4
A. Derivata—Ap. 24
C. Propugnata—Jn. 5
C. Ferrugata—May 9
C. Unidentata—Ap. 26
C. Bilineata—June 8, S.P.
S. Dubitata—Mar. 14
S. Vetulata—Jy. 13
S. Rhamnata—Jy. 13
E. UNDULATA—June 19
C. Corylata—May 11
C. Russata—Jy. 13
C. Immanata—Jy. 9
C. Prunata—Jy. 8
C. Testata—Jy. 12
C. Fulvata—Jy. 3
C. Pyraliata—Jy. 22
E. Mensuraria—Aug. 2
O. Chærophyllata—June 8

PYRALIDINA.

H. Proboscidalis—June 26
H. Barbalis—May 30
H. Tarsipennalis—Jy. 4
O. Pingunalis—May 30
B. Urticalis—Jy. 25
S. Prunalis—June 29
N. Cucullatella—Jy. 16
S. Fabriciana—May 18
C. Pratellus—June 5
C. Hortuellus—June 5

TORTRICINA.

A. Cynosbatella—June 6
A. Pruniana—June 18
T. Viridana—Jy. 18
T. Heparana—Jy. 5
L. Xylosteana—Jy. 6
A. Conwayana—Jy. 19

C. Ulicitana—Ap. 30
X. Zoegana—June 27
T. Hyemana—Mar. 16

TINEINA.

I. Masculella—May 16
N. Swammerdammella—May 18
N. Schwarziella—May 21
A. DeGeerella—June 5
M. Aruncella—June 16
M. Seppella—June 16
M. Thunbergella—May 25
M. Purpurella—May 18
P. Cruciferarum—May 11, O.E.
C. Xylostella—May 11
D. Applana—Jan. 15
D. Sulphurella—May 4
A. Pfeifferella—May 15
O. Anglicella—May 21
C. Flavicaput—May 18
E. Nigrella—May 11
E. Triatomea—May 21
L. Cramerella—May 11
L. Pomifoliella—May 11
L. Quercifoliella—Ap. 27
L. Tristrigella—Ap. 30

PTEROPHORINA.

P. Pentadactylus—June 23
A. Polydactylus—May 1.

Added by E. Meyrick, Esq.

C. Abrasana—July, 1875.
P. Gibbosella—Oct. 4, 1877.
G. Politella—Jy. 10, 1877.
E. Trapeziella—Jy., 2, 1877.

BOTANICAL REPORT.

For the last 13 years we have taken very full records of the first flowering of plants, and during the latter part of that time, the *duration* of the flower has been as far as possible added. This year a very fairly complete record of all our wild flowers have been kept, and is now printed in a form which may prove serviceable and interesting. In the first column are the initials of the Discoverer of the "first flower," in the next the names of the plants in the order of the "London catalogue" 7th edition, in the next 12, the defferent months of the year, and in the last column the number of days in which the plant lasted in flower. It would be an almost impossible task to secure the actual date of "first" and "last" flower in every case, but when we have every reason to suppose that we have secured them, the dates are recorded, *e.g. Clematis Vitalba* began to flower on the 13th of July and the last specimen seen was on the 13th of October, the plant thus lasting in flower 92 days. It is clearly possible that the latter date, especially, may not be correct, but we have omitted all dates open to doubt. Thus in the case of *Ranunculus Drouettii*, it was found in full flower on June 8th, a ... is consequently put in the June column to show that it was in flower in that month. So also when the actual date of first flower has escaped notice a ... is placed to indicate that it was found in flower in that particular month.

The past year has been a very extraordinary one, as regards vegetation. The very mild December allowed many plants to "hang on" beyond their usual time of departure, and also the mild January and February brought some plants into flower before their usual time. Whenever stray specimens in either of the above cases were found the fact is indicated by a *, this mark being employed to show that specimens were found in that particular month, but could not be considered as normal specimens. During March many such specimens occurred.

Another fact to be noticed is the fact that plants had no rest, but what with the mild weather, the damp and an unusually small amount of sunshine, they (1) did not flower as abundantly as usual, (2) produced an unusual number of monstrosities and (3) in many instances had a "second flowering." In the first case, gardens were not as bright as usual, but remained very "green" all the year. As for the second fact, a few of the more remarkable monstrosities may be mentioned. A specimen of the common Broomrape (*Orobanche minor*), which is normally unbranched, was found with the lower

flowers turned into branches, and assuming the appearance of the very rare Branched Broomrape (*O. ramosa*). The potato buds on the stem were not unfrequently turned into potatoes. The parts of the flower were very frequently turned into leaves, the most curious case which came under my observation being that of the common Garden Pea, which instead of producing pods, had all the flowers assuming the appearance of green roses. And fourthly, the union of branches side by side, so as to present a flattened surface, was also of very common occurrence. As for the "second flowering," it has been so very frequent this year that it would be impossible to enumerate all occurrences; the most remarkable were the Goldilocks (*R. auricomus*), in October, the Wintercress (*Barbarea vulgaris*) in October, Holly (*Ilex aquifolium*) in November, Barren Strawberry (*Potentilla Fragariastrum*) in October, Wild Chervil (*Chærophyllum sylvestre*) in October and November, Ground Ivy (*Nepeta glechoma*) in October, Bugle (*Ajuga reptans*) from August to December, Primrose (*Primula vulgaris*) throughout the year, and Dog's Mercury (*Mercurialis perennis*) from September to December.

The duration of flowering is very remarkable, in some cases being very short and in others unusually long. I have every reason to believe that the times mentioned are correct.

Two points are brought out by the tabular form in which the observations have been recorded; one the number of plants in flower at any particular time of the year can be very easily calculated; the other, the *constitution*, if I may so term it, of each species is seen at a glance; not only whether it comes into flower at the same time as the other species of its order, but also whether it lasts longer.

This being a very exceptional year, the Table must not be taken as at all exhibiting the *average* flowering or duration of the various species, but it will be very interesting for comparison if we can manage to bring out similar Tables in subsequent years.

Names of those whose Initials occur in the List:—

A.E.A.	A. E. Aldworth.
F.S.A.	F. S. Alston.
G.H.B.	G. H. Berkeley.
E.B.B.	E. B. Blackburne.
C.E.B.	Mrs. Burd.
W.H.C.	W. H. Chappel.
J.P.C.	J. P. Clarke.
H.J.C.	H. J. Cooper.
E.M.R.C.... ...	E. M. R. Cox.
J.H.C.D.	J. H. C. Dalton.

G.E.D.	G. E. Dartnell, Esq.
G.W.D.L. ...	Rev. G. W. De Lisle.
W.H.M.D. ...	W. H. M. D'Urban.
O.E.	O. Elton.
E F.	E. Feetham.
K.G.	Miss K. Gwillim.
D.A.H.	D. A Hailes
W.J H.	W. J. Hemsley.
H.P.H.	H. P. Highton.
H.R.H.	H. R. Hordern.
T.G J.	T. G. Juckes.
E.M.	Miss Mansell.
N.M.	N. Masterman, Esq.
W.M.H M. ...	W. M. H. Milner.
D E.O.	D. E. Olivier.
E A.O.	Miss E. A. Ormerod.
S.A.P.	S. A. Pearse.
E.P.	Miss E. Preston.
M.E.P.	Miss M. E. Preston.
F.M.P.	F. M. Preston.
G B.R.	G. B. Routledge.
E.T.S.	E. T. Sankey.
F.E.S.	Mrs. Stolterfoth.
C.A.S.	Rev. C. A. Stolterfoth.
J.S.	Rev. J. Sowerby.
R.P.T	Mrs. R. P. Tanner.
C.E.T.	Rev. C. E. Thorpe.
E.C.V.	E. C. Vincent.
E.G.W.	E. G. Waddilove.
S.B.W.	S. B. Wilson.
W.H.E.W. ...	W. H. E. Worship.

		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	
	Clematis													
W.M.H.M.	Vitalba							18	...	...	18			92
	Thalictrum													
D.E.O.	flavum						23	...						
	Anemone													
	nemorosa		24	...	...	11								76
	Myosurus													
E.F.	minimus					4	15							42
	Ranunculus													
	circinatus							...						
	floribundus			*	5	...	...	...	2					119
C.E.T.	penicillatus			9	...	...	...	...	10					154
G.H.B.,E.B.B.	Drouetti						...							
E.A.O.	Flammula						8	...	...	...	...	26		171
	auricomus			23	...	25					*			63
F.M.P.	acris		*	20	...	...	...	...	...	...	...	...	6	261
	repens	*		21	...	...	...	...	...	...	...	...	6	260
C.E.T.	bulbosus			20	...	...	30				14	...	6	102
W.M.H.M.	parviflorus						8							
	arvensis					11	22							42
K.G.,	Ficaria	18	...	...	...	18								120
	Caltha													
F.S A.,H.J.C.	palustris			19	...	..	...	22				8	26	123
	Helleborus													
	viridis			17	...	12								54
	Aquilegia													
W.H.E.W.	vulgaris						*	8						
	Papaver													
	Rhœas							6	...	...	...	...	19	166
	strigosum								22	...	19			58
	dubium													
A.E.A.	Lamottei						12	...						
W.H.E.W.	Lecoqii							8	...	...	...	16		161
W.H C.	Argemone						25	...	...	...	...	...	18	172
	Chelidonium													
	majus					30	...	...	...	...	...	30		183
	Fumaria													
	officinalis					*	7	...	...	...	...	...	16	193
	Raphanus													

J. F. M. A. My. J. Ju. A. S. O. N. D.

		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	
	Raphanistrum					6	...	...	...	...	...	26		204
	Sinapis													
	arvensis	*		13	...	...	...	...	...	...	...	...	6	268
	alba					5	...	...	...	...	...	...	6	215
	Brassica													
	oleracea				26	...	...	...	24			*		120
	Napus			23	...	...	15				...	2		84
	Rutabaga				12	...	...					*		
	Diplotaxis													
W.M.H.M.	muralis						...	...	...	...	...	26		
	Sisymbrium													
	officinale					9	...	...	...	...	...	2		177
	Alliaria				19	...	...	2						74
	Cardamine													
C.E.T.	pratensis			17	...	...	22							97
	hirsuta		3	...	...	18		*			18	...	6	104
	sylvatica					...	...				*			
	Arabis													
C.E.T.	thaliana				21	18								
W.M.H.M.	hirsuta			*		...	...							
	Barbarea													
	vulgaris				30	...	22				*			53
	Nasturtium													
D.E.O.	officinale					25	...	...	...	...	...	13		172
	Armoracia													
W.H.C.	rusticana					25	22							28
	Draba													
	verna		17	...	...	18								90
	Capsella													
	Bursapastoris	..	...	...	...	...	...	...	...	...	...	...	...	
	Lepidium													
	campestre				29	...	...	31			8	2		93
	Senebiera													
	Coronopus					9	...	...	...	...	14			158
	Reseda													
	lutea					28	...	...	...	...	12			137
W.M.H.M.	Luteola						1	...	...	...	...	19		171
	Helianthemum													
	vulgare					17	...	...	...	...	...	13		180
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.	

		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	
	Viola													
JPC,WHMD.	odorata			2	5									34
G.B.R.	hirta			19	30									42
	sylvatica													
	Riviniana			21	...	25		13	...	...	...	4		179
E.C.V.	Reichenbachiana			*		4								
G.W.D.L.	canina					3	8							36
W.M.H.M.	tricolor				...				...					
	arvensis	...	...	*	26	...	...	...	...	...	...	26		214
	Polygala													
	vulgaris				26	...	...	...	...	...	...	18		206
W.H.C.	depressa					25	...							
W.J.H.	calcarea					4	...	9						66
	Saponaria													
	officinalis								19	28				40
	Silene													
W.H.E.W.	inflata					30	...	...	15					77
J.S.	noctiflora										...	2		
	Lychnis													
	vespertina					13	...	...	...	...	29			169
	diurna			*	27	...	...	...	...	...	...	26		244
W.M.H.M.	Flos-cuculi					14	...	...	15		*			93
	Githago								12					
	Moenchia													
	erecta				29	...								
	Cerastium													
	glomeratum	...			18	...	...	2			...	...		75
	triviale	...	...	...	...	...	...	...	...	...	...	...	...	
	Stellaria													
	aquatica								...					
	media	...	...	...	...	...	...	...	...	...	...	...	...	
D.E O.	Holostea			*	5	...	22							77
W.M.H.M.	graminea			*		25	...	...	...	...	...	26		185
	uliginosa					9	22							44
	Arenaria													
W.M.H.M.	trinervis				10	...	...	...	9					121
G.W.D.L.	serpyllifolia	...	...	...	...	9	...	...	...	...	...	...	6	211
	Sagina													
	procumbens				28	...	...	...	...	...	...	...	6	222
		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	

		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	
	nodosa								27					
	Spergula													
W.M.H.M.	arvensis					18	...	...	...	...	...	2		168
	Spergularia													
J.S.	rubra										...			
	Scleranthus													
E.A.O.	annuus						12	...	...	...	...	13		154
	Montia													
	fontana				...									
	Hypericum													
G.W.D.L.	perforatum						28	...	...	...	8			102
F.S.A.	tetrapterum						29	...	15					47
	humifusum							13	10					28
D.A.H.	pulchrum							1	12					43
	hirsutum						29	...	24					56
	Malva													
E.T.S.	moschata						29	...	...	...	...	13		137
G.W.D.L.	sylvestris						10	...	...	...	24			136
	rotundifolia	...				18	...	...	...	...	...	26		192
	Tilia													
	intermedia							4	1					28
	Linum													
	catharticum					4	...	...	...	...	24			173
	Geranium													
	pratense					25	...	...	...	...	...	2		161
	pyrenaicum					1	...	..	...	...	24			176
	molle			*	23	...	...	...	12	...	*			111
	rotundifolium					9	...							...
W M.H.M.	dissectum					17	...	...	...	...	...	26		193
	columbinum					10	...	...	...	...	...	...	6	210
C.E.T.	lucidum					4	...	...	...	...	13			162
C.E.T.	Robertianum				26	...	...	...	...	...	...	16		204
	Oxalis													
	Acetosella				23	8								15
	Ilex													
C.E.T.,E.G.W.	Aquifolium					10	22					*		43
	Euonymus													
W.M.H.M.	europæus					16	...	2						47
	Rhamnus													
		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	

		J. F. M. A. My. J. Jy. A. S. O. N. D.	
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	Acer		
C.E.T.	Pseudo-Platanus	3 8	35
C.E.T.	campestre	3-18	15
	Ulex		
	europæus	... ... 22 27	
	nanus	... 19	
	Genista		
W.M.H.M.	tinctoria	8 ...	
	Sarothamnus		
G.W.D.L.	Scoparius	2 22	51
	Ononis		
	spinosa	13	
	arvensis	13 8	87
	Anthyllis		
G.W.D.L.	vulneraria	10 31	174
	Medicago		
	lupulina	19 13	206
	Melilotus		
	officinalis	4 17	44
	Trifolium		
	pratense	27 19	206
	medium	16 ...	
W.H.E.W.	incarnatum	18 ... 2	45
J.S.	arvense	... 26	
	hybridum	20 24	126
	repens	14 2	172
	procumbens	6 13	160
	minus	29 2	187
	Lotus		
	corniculatus	12 27	138
	major	9 15	37
	Astragalus		
W.H.M.	glycyphyllus	13	
	Hippocrepis		
W.H.C.	comosa	23 ... 2	40
	Onobrychis		
	sativa	17 3	170
	Vicia		

		J. F. M. A. My. J. Ju. A. S. O. N. D.	
	hirsuta	5 26	205
	tetrasperma	8 26	171
E.M.	Cracca	28 ... 24 .	57
J.H.C.D.	sylvatica	6 15	131
	sepium	26 2	190
F.E T.	sativa	6 15	162
	angustifolia	15 ... 2	48
	segetalis	6	
	Lathyrus		
W.M.H.M.	pratensis	* 6 8	124
	Orobus		
	tuberosus	22 2	71
	Prunus		
	spinosa	13 ... 8	56
	Cerasus	26 ...	
	Spiræa		
W.H.C.,E.A.O.	Ulmaria	17 26	162
E.T.S.	Filipendula	22 ...	
	Agrimonia		
	Eupatoria	28 29	123
	odorata	2 19	109
	Poterium		
	Sanguisorba	27 2	189
	Alchemilla		
W.M.H.M.	arvensis	21 ... ... 22 12 19	93.98
	vulgaris	22 13	82
	Potentilla		
	Fragariastrum	21 ... ... 25 *	124
G.W.D L.	Tormentilla	4 13	193
W.M.H.M.	reptans	20 8	110
	anserina	9 ... ... 24 *	107
	Fragaria		
E.M.R.C.	vesca	* 19 ... ... 13 14 26	85
	Rubus		
W.M.H.M.	Idæus	30 22	23
	discolor	4 2	121
	corylifolus ?	10 19	131
H.P.H.	cæsius	26 9	167
	Geum		

J. F. M. A. My. J. Ju. A. S. O. N. D.

		J.	F.	M.	A	My.	J.	Ju.	A.	S.	O	N.	D.	
W.M.H.M.	urbanum				* 24	...	...	...	...	...	...	...	6	226
	rivale				29	...	...	2						64
	Rosa													
E.P.	tomentosa						22	...						
Mrs. Thorpe	canina					31	...	13						43
F.S.A.	arvensis						20	13						23
	Cratægus													
J.H.C.D.	Oxyacantha					11	22							42
	Pyrus													
J.H.C.D.	malus					4								
	Lythrum													
W.H E.W.	Salicaria							...	15					
	Epilobium													
	angustifolium						23	...	24					62
	hirsutum							9	24					46
	parviflorum							9	...	...	...	19		133
F.S.A.	montanum						8	...	...	...	24			138
	tetragonum								4					
	palustre							13	...					
	Circæa													
	lutetiana							4	24					51
	Callitriche													
	verna					9	...	...	2					85
	Bryonia													
	dioica					28	...	...	24					88
	Ribes													
	Grossularia			10	...	8								59
W.M.H.M.	nigrum					...								
	Sedum													
	album								...					
E.A.O.	acre						13	13						80
	reflexum							...	...					
	Saxifraga													
	tridactylites			5	...	...	22							109
	granulata				27	...	15							49
	Chrysosplenium													
	oppositifolium						6							
	Hydrocotyle													
	vulgaris								13					
		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	

		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	
	Sanicula													
	europæa				29	...	...	2						64
	Helosciadium													
A.E.A.	nodiflorum						22	...	...	...	..	2		133
	inundatum						14							
	Sison													
	Amomum							...	...	...	17			
	Œgopodium													
	Podagraria					18	...							
	Bunium													
	flexuosum					4	...	18						70
	Pimpinella													
W.M.H.M.	Saxifraga						1	...	...	...	...	26		178
	Œnanthe													
W.H.C.	crocata					25	...	...	15					82
	Sium													
	angustifolium							9	...	...	...	4		118
	Æthusa													
	Cynapium					*	6	...	...	...	...	26		173
	Silaus													
	pratensis										...			
	Angelica													
	sylvestris				*	*		29	...	...	...	13		107
	Pastinaca													
W.M.H.M.	sativa	...	...	...		18	...	...	...	...	...	26		192
	Heracleum													
W.M.H.M.	Sphondylium			*		4	...	...	...	...	...	26		206
	Daucus													
W.H.H.M.	Carota					*	8	...	...	...	...	19		164
	Torilis													
	infesta							18	...	...	...	9		119
	Anthriscus					28	...	...	...	...	18			188
E.T.S.	nodosa							11	17					87
	Chærophyllum													
	sylvestre	18	...	...	...	...	...	...	12		23	26		206
W.M.H.M.	temulum					16	...	...	...	...	...	2		170
	Scandix													
	Pecten-Veneris				*	4	...	...	...	...	...	2		182
	Conium													
		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	

		J. F. M. A. My. J. Jy. A. S. O. N. D.	
W.M.H.M.	maculatum	8 ... 15	68
	Hedera		
	Helix	21 6	76
	Cornus		
E.A.O.	sanguinea	14 2 * * *	18
	Adoxa		
	Moschatellina	22 8	75
	Sambucus		
W.M.H.M.	nigra	21 ... 13	53
	Viburnum		
W.H.C.	Opulus	25 23	29
	Lantana	26 ... 8	43
	Lonicera		
W.H.E.W.	Periclymenum	8 2	147
	Galium		
	cruciatum	27 13	77
G.W.D.L.	verum	28 4	129
E.T.S.	Mollugo	11 31	142
D.A.H.	saxatile	2 2	30
	palustre	22 ... 15	54
	Witheringii	22	
	uliginosum	8 ... 15	68
	Aparine	4 26	206
W.H.E.W.	tricorne	6 22	138
	Asperula		
	odorata	27 ... 22	56
M.E.P.	cynanchica	14 ... 24	71
	Sherardia		
C.E.T.	arvensis	2 31	182
	Valeriana		
	dioica	30 ... 15	46
W.M.H.M.	officinalis	* 8 ... 15	68
	Valerianella		
W.M.H.M.	olitoria	* 30 2	64
	dentata	 16	
	Dipsacus		
	sylvestris	29 31	94
	pilosus	22 13	83
	Scabiosa		

J. F. M. A. My. J. Ju. A. S. O. N. D.

		J.	F.	M	A.	My.	J.	Ju.	A.	S	O	N.	D.	
	succisa								6	...	...	2		88
E.R.B.	columbaria						16	...	...	...	...	...	6	173
	arvensis						8	...	...	...	...	26		171
	Carduus													
G.W.D.L.	nutans					*	14	...	...	...	...	26		165
	crispus					*14	...	...	...	...	...	13		183
	lanceolatus							13	...	...	...	19		129
	eriophorus								1					
W.H.C.	palustris					23	...	...	...	...	...	19		180
	tuberosus							2	...	...	17			107
G.W.D.L.	acaulis							4	...	...	...	4		123
W.M.H.M.	arvensis						29	...	...	...	...	19		143
	Carlina													
	vulgaris								14					
	Arctium													
	majus								...					
	minus								...					
	intermedium							13	...	...	24			103
	nemorosum								...					
	Serratula													
	tinctoria								4	...	17			74
	Centaurea													
E.T.S.	nigra						29	...	...	...	...	26		150
	Scabiosa						15	...	...	...	...	26		164
	Cyanus						20	...	...	...	...			
	Chrysanthemum													
W.H.C.	segetum					25	...	...	...	...	...	26		185
W.M.H.M.	Leucanthemum					16	...	...	...	...	31			168
	Matricaria													
	inodora	...	...	...	...	...	8	...	...	...	...	...	...	
	Parthenium										...			
	Tanacetum													
J.S.	vulgare										...	13		
	Anthemis													
W.H.E.W.	Cotula						22	...	...	...	...	26		157
F.S.A.	arvensis						13				...	2		
	Achillea													
W.H.E.W, E.T.S.	Millefolium	...	...				22	...	...	...	...	...	6	167
	Ptarmica								...					
		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.	
	Artemisia													
W.H.C.	vulgaris						*	1	24					23
	Gnaphalium													
	uliginosum								12	...	8			57
J.S.	sylvaticum										...	9		
	Senecio													
	vulgaris	...	...	...	...	...	...	...	...	...	...	...	...	
	sylvaticus							13	...	...	...	26		136
	crucifolius										...	9		
D.A.H.	[Jacobæa						29	...	...	...	...	...	6	160
W M.H.M.	aquaticus						10	...	...	...	...	...	6	179
	campestris						6							
	Inula													
	Conyza										...			
	Dysenterica								14					
	Bellis													
	perennis	...	...	...	...	...	...	...	...	...	...	...	...	
	Erigeron													
	acris										...	19		
	Solidago													
	Virga-aurea										...	18		
	Tussilago													
	Farfara		17	...	...	6								78
	Petasites													
	vulgaris	*	7	...	...	11								93
	Eupatorium													
F.E.S.	cannabinum								7	...	4			58
	Cichorium													
J.S.	Intybus										...			
	Lapsana													
F.S.A.	communis						22	...	...	...	..	26		157
	Hypochœris													
F.S.A.	radicata					18	..	...	...	...	...	9		175
	Leontodon													
	hirtus						27	...	...	...	...	26		152
W.M H.M.	hispidus					18	...	...	...	...	...	13		179
	autumnalis						28	...	...	...	...	26		151
	Picris													
		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	

		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	
	hieracioides								4	...	...	26		114
	Helminthia													
J.S.	echioides											...		
	Tragopogon													
W.M.H.M.	minor					30	...	...	...	...	...	4		158
	Taraxacum													
	officinale	...	...	...	...	...	...	...	...	...	...	...	...	
	Lactuca													
	muralis					29								
	Sonchus													
	oleraceus						6	...	...	...	...	26		173
	asper					4	...	...	...	...	...	...	6	216
	arvensis							9	...	...	19			102
	Crepis													
	virens	...		*		17	...	...	...	...	...	26		193
E.T.S.	setosa							18	...	..	...	2		107
	Hieracium													
D.A.H.	Pilosella					12	...	...	...	...	18			159
	vulgatum						15	...	...	...	...	13		151
	boreale								1	...	...	9		100
	Phyteuma													
	orbiculare								...	...	17			
	Campanula													
G.W.D L.	glomerata					*		13	...	...	...	2		112
G.W.D L	Trachelium							1	...	...	4			95
	rotundifolia							13	...	...	...	13		123
	patula								2	...	8			67
	Calluna													
C.A.S.	vulgaris								1	...	15			75
	Fraxinus													
	excelsior				23	...								
	Ligustrum													
O.E.	vulgare					*	8	13						35
	Vinca													
	major			11	...	...	22							103
	minor		8	...	...	6								87
	Erythræa													
F S A.	Centaurium							17	...	...	...	19		125
	Gentiana													
		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	

		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	
	Amarella						29	...	24					56
	campestris							26	...	...	13			79
	Menyanthes													
J.H.C.D.	trifoliata					11	15							35
	Convolvulus													
G.W.D.L.	arvensis						28	...	...	...	16			110
F.S.A.	sepium							14	...	...	...	2		111
	Solanum													
D.E.O.	Dulcamara					25	...	...	...	24				122
	Verbascum													
F.S.A.	Thapsus							11	24					42
D.A.H.	nigrum							14	...	...	1			79
	Scrophularia													
	Balbisii						15	...	...	...	...	19		157
W.H.M.D.	nodosa					28	...	..	...	...	...	9		165
	Linaria													
	Cymbalaria				28	...	...	...	...	...	...	...	6	222
J.S.	Elatine										...	19		
J.S.	spuria										...			
G.W.D.L.	vulgaris						*	13	...	...	13			92
F.S.A.	minor							...	...	...	...	2		
	Veronica													
	hederifolia	...	...	...	...	...	...	2				16	6	
	polita	...	...	..	...	...	...	...	...	...	...	...	...	
	Buxbaumii	...	...	...	...	...	...	...	...	...	...	...	...	
	arvensis	...	*	27	...	...	...	...	...	...	...	..	...	
W.M.H M.	serpyllifolia			4	...	...	...	14		23	16			132
D.A.H.	officinalis				25	...	..	...	...	29				157
	Chamædrys		*31	...	...	...	...	13		*				135
D.A H.	montana				11									
	scutellata					15	...	15						61
	Anagallis				28	...	...	...	...	...	4			160
	Beccabunga				9	...	...	...	...	8				152
	Euphrasia													
G.W.D.L.	officinalis					8	...	...	...	12				126
	Bartsia													
S.B.W.	Odontites					18	...	...	...	8				112
	Pedicularis													
	palustris						...	...						
		J.	F.	M.	A.	My	J.	Ju.	A.	S.	O.	N.	D.	

		J. F. M. A. My. J. Ju. A. S. O. N. D.	
	sylvatica	22 2	71
	Rhinanthus		
	Crista-galli	10 ... 31	82
	Melampyrum		
W.H.E.W.	pratense	26 17	83
	Lathræa		
	squamaria	23 11	18
	Orobanche		
D.E.G	elatior	5	
	minor	17 2	77
	Verbena		
	officinalis	15 30	46
	Lycopus		
	europæus	13	
	Mentha		
	viridis	15	
	hirsuta	29 15	78
F.S.A.	arvensis	23 18	87
J.S.	Pulegium	 2	
	Thymus		
A.E.A.	Serpyllum	2 2	153
W.M.H.M.	Chamædrys	13 13	31
	Origanum		
	vulgare	... 26	
	Calamintha		
	Clinopodium	9 4	118
	menthifolia	28 13	77
	Nepeta		
	Cataria	 24	
	Glechoma	* 7 ... ... 2 *	117
	Salvia		
W.M.H.M.	Verbenaca	11 4	177
	Prunella		
E.A.O.	vulgaris	16 4	141
	Scutellaria		
	galericulata	28 19	113
	Ballota		
	nigra	28 4	129
	Stachys		

J. F. M. A. My. J. Ju. A. S. O. N. D.

		J. F. M. A. My. J. Jy. A. S. O. N. D.	
F.S.A.	Betonica	* 5 13	131
	palustris	13 12	91
	sylvatica	6 13	160
	arvensis	...	
	Galeopsis		
F.S.A.	Ladanum	18 2	107
E.T.S.	Tetrahit	* 11 6	148
	Lamium		
	amplexicaule	... ... 7 16	
	purpureum	... ...	
	album	 6	
	Galeobdolon	26 28	32
	Ajuga		
	reptans	27 ... 22 1 6	56-127
	Teucrium		
	Scorodonia	... 13	
	Echium		
	vulgare	2 30	59
	Lithospermum		
G.W.D.L	officinale	10 23	166
	arvense	27 26	213
	Myosotis		
W.M.H.M.	palustris	1 13	165
	arvensis	18 19	215
	collina	22 15	85
T.G.J.	versicolor	7 ... 2	56
	Anchusa		
	arvensis	25 26	185
	Symphytum		
	officinale	26 2	190
W.M.H M.	asperrimum	14 2	172
	Cynoglossum		
G.W.D.L.	officinale	23 ...	
	Primula		
	vulgaris	... ... 25 * * * 27	
	officinalis	* 12 ... 16	65
	Lysimachia		
G.W.D.L.	Nummularia	28 ... 10	43
D.E.O.	nemorum	25 19	147

J. F. M. A. My. J. Ju. A. S. O. N. D.

		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	
	Anagallis													
	arvensis					15	...	...	...	...	...	19		188
	Plantago													
	major						6	...	...	...	14			130
	media					17	...	...	...	...	15			151
C.E.T.	lanceolata				13	...	...	...	...	...	...	16		217
	Chenopodium													
	album							9	...	...	15			98
G.W.D.L.	B. Henricus					9	...	...	...	...	14			158
	Atriplex													
F.S.A.	angustifolia						29	...	24					56
	erecta								10	...	...	16		98
	Rumex													
	conglomeratus						22	...	...	...	12			112
	nemorosus						28	...	...	...	31			125
	pulcher							31						
F.S.A.	obtusifolius					18	...	...	...	...	...	26		192
	crispus						6	...	...	..	...	19		166
	Hydrolapathum							9	24					46
	Acetosa					9	22							44
D.E.O.	Acetosella				*	5	...	...	...	...	...	26		205
	Polygonum													
	Fagopyrum							...	...					
	Convolvulus						20	...	...	...	...	16		149
W.H.E.W.	aviculare						8	...	...	...	...	13		158
	Hydropiper								13	...	...	19		99
W.H.E.W.	Persicaria						23	...	...	...	...	19		150
W.H.E.W.	lapathifolium						22	...	...	...	...	4		135
W.M.H.M.	amphibium						22	...	24					63
	terrestre								24					
D.E.O.	Bistorta					30	...	...	14					76
	Daphne													
	Laureola	29	...	...	...	11								102
	Buxus													
	sempervirens			7	30									54
	Euphorbia													
	Helioscopia	...	...	...	...	4	...	...	...	...	...	...	...	
	amygdaloides				27	...	...	2			*			66
	Peplus	...	...	...		8	...	...	...	...	...	...	6	212
		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	

		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	
	exigua							9	...	...	...	19		133
	Mercurialis													
	perennis	31	...	...	...	25				27	...	...	6	114
	Parietaria													
W.M.H.M.	diffusa						30	...						
	Urtica													
J.H.C.D.	dioica					21	...	...	...	28				130
	urens	...	...	...	...	...	...	...	...	...	...	...	...	
	Humulus													
C.E.B.	Lupulus								14					
	Ulmus													
	suberosa		3,31											28
	montana		26	...	5									38
	Quercus													
C E.T.	Robur					3,25								22
	Castanea													
	vulgaris							...	...					
	Corylus													
	Avellana		8	...	...	6								87
	Betula													
	alba				27									
	Populus													
	nigra				...									
	Salix													
W.M.H.M.	fragilis					...								
	triandra				...	25								
	viminalis			2	12									41
	caprea			8	...	9								62
	Taxus													
	baccata		18	...	4									45
	Typha													
	latifolia								...					
	Sparganium													
F S.A.	ramosum						22	...	15					54
	simplex -							...						
	Arum													
C.E.T.	maculatum				26	18								22
	Lemna													
E.A.O.	minor						14							
		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	

		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	
	Potamogeton													
W.M.H.M.	natans					25	22							28
	crispus						...							
	densus					17	...	2						46
	Triglochin													
	palustre							...						
	Sagittaria													
	sagittifolia						5							
	Alisma													
W.M.H.M.	Plantago						29	...	15					47
	Butomus													
	umbellatus							1						
	Elodea													
	canadensis							...						
	Orchis													
	pyramidalis						14	2						18
W.H.C.	ustulata					25	...	2						38
H.R.H.	Morio					2	16							45
C.E.T.	mascula				22	...	8							47
W.H.E.W.	incarnata					30	...	2						33
	latifolia						10	9						29
D.E.O.	maculata					30	22							23
	Gymnadenia													
W.M H.M.	conopsea					25	...	13						49
	Habenaria													
E.A.O.	viridis						15							
N.M.	bifolia						1							
O.E.	chlorantha					25	...	2						38
	Herminium													
G.W.D.L.	Monorchis						9	29						40
	Ophrys													
W.H.C.	apifera						22	...						
	Spiranthes													
R.P.T.	autumnalis							...	...					
	Listera													
E.F.	ovata					4	...	2						59
	Neottia													
W.H.E.W.	Nidus-avis						6							
	Epipactis													

		J,	F.	M.	A.	My.	J,	Ju.	A.	S.	O.	N.	D.	

		J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O	N.	D.	
	lati'olia						22	...						
	Cephalanthera													
G.E.D.	grandiflora					15	...	2						48
	Iris													
	foetidissima						17	...						
W.H.E.W.	Pseudacorus					21	...	13						58
	Narcissus													
	Pseudo Narcissus	17	...	28										70
	Galanthus													
	nivalis	29	...	...	4									65
	Tamus													
W.H.C.	communis					25	...	13						49
	Paris													
H.J.C.	quadrifolia						1	...						
	Polygonatum													
D A.H.	multiflorum					11,28								17
	Ruscus													
	aculeatus	...	...	...	...	17				29	...	...		
	Tulipa													
	sylvestris				5,27									22
	Scilla													
	nutans					12	...	15						64
	Allium													
E.T.S.	vineale							13						
E.F.	ursinum						2	15						44
	Luzula													
	pilosa				8	...	8							61
	campestris				20	...	8							49
	multiflora						6							
	Juncus													
	conglomeratus							9						
	effusus							13						
	glaucus							9						
	acutiflorus							9	...	...	15			98
D.A.H.	lamprocarpus						29	...	24					56
	bufonius							9	...	...	...	2		116
	Scirpus													
	palustris					23	...	...	1					65
	lacustris						14	...						
		J.	F.	M.	A.	My.	J.	Ju.	A	S.	O.	N.	D.	

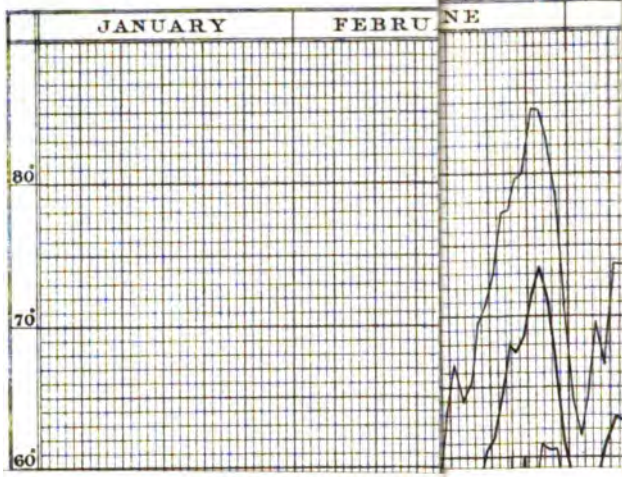
		J. F. M. A. My. J. Jy. A. S. O. N. D.	
	Carex		
W M.H M.	pulicaris	...	
W.M.H.M.	disticha	11 ...	
	paniculata	6	
W.M H.M.	vulpina	1	
C.E.T.	muricata	3 22	50
	remota	18	
	acuta	9	
	glauca	27 ... 8	42
C.E.T.	præcox	26 ...	
	pendula	9	
	sylvatica	2	
	hirta	9 ...	
C.E.T.	paludosa	26 18	22
C.E.T.	riparia	1,18	17
	ampullacea	...	
	Anthoxanthum		
	odoratum	12 27	168
	Digraphis		
	arundinacea	6 8	124
	Phalaris		
	canariensis	 12	
	Alopecurus		
G.W.D.L.	agrestis	4 26	206
	geniculatus	9 8	152
	pratensis	12 2	112
	Phleum		
	pratense	20 26	159
	nodosum	22 ...	
	Agrostis		
	alba	9	
	vulgaris	15 ... 24	70
	Phragmites		
	communis	31 2	94
	Milium		
	effusum	27 ... 22	56
	Aira		
	cæspitosa	8 4	149
	Avena		
		J. F. M. A. My. J. Ju. A. S. O. N. D.	

	J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	
flavescens					30	...	...	24		3	16		86
pubescens					5	22							48
pratensis					30	22							23
elatior					28	...	...	...	...	...	26		182
Holcus													
mollis						20	...	...	...	19			121
lanatus					9	...	...	...	...	...	19		194
Koeleria													
cristata					31	...	2						33
Melica													
uniflora					4	...	2						59
Glyceria													
fluitans		22	...	...	...	...	...	...	...	...	26		249
plicata					17	...	...	...	...	...	2		169
aquatica						20	...	...	...	12			114
Poa													
annua	...	...	...	...	...	...	...	...	...	...	...	...	
compressa					30	...	...	14					76
pratensis				22	...	...	13						82
trivialis					10	...	...	15					97
Briza													
media					9	...	13						65
Cynosurus													
cristatus					30	...	...	...	...	12			135
Dactylis													
glomerata					9	...	...	...	...	...	26		201
Festuca													
sciuroides					17	22							36
ovina					11	...	9						59
rubra					9	...	13						65
elatior						14	2				*		18
arundinacea						10	...	23					74
pratensis					28	...	...	...	24				119
loliacea						20	...						
Bromus													
giganteus							4	...	...	...	26		145
asper						6	...	24			*		79
erectus				27	...	...	2						66
sterilis					4	...	...	...	...	...	16		196
	J.	F.	M.	A.	My.	J.	Ju.	A.	S.	O.	N.	D.	

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.	
	racemosus						...				...	...		
	commutatus										...			
	mollis		* 12	...	...	...	...	...			24			195
	Brachypodium													
	sylvaticum						22	...	...	...	...	26		157
	pinnatum						...							
	Triticum													
	caninum						20	...	15					56
	repens						20	...	...	...	...	13		146
	Lolium													
	perenne		27	...	...	...	...	...	...	...	...	26		213
	Italicum						1	...	...	...	...	16		168
	Hordeum													
	pratense						29	13						14
	Ophioglossum													
	vulgatum						22	...						
	Equisetum													
C.E.T.	arvense		24	8										14
	palustre					9	...	9						61
A.E A.	limosum					10	...	...	15					97

CULTIVATED SPECIES.

Aesculus Hippocastanum—May 3rd.
Geranium sylvaticum—May 17th.
Staphyllea pinnata—April 30th.
E.P. Cytisus Laburnum—May 5th.
Pyrus Aucuparia—May 14th.
Pyrus Japonica—January 28th.
Ribes sanguineum—March 12th.
S.A.P. Philadelphus coronarius—May 30th.
Cornus mascula—February 18th.
J.P.C. Lonicera caprifolium—full, June 8th.
J.P.C. Lymphoricarpos racemosus—June 8th.
Syringa vulgaris—April 30th.
Atropa Belladonna—June 8th.
Lycium Barbarum—May 25th.
Larix europæa—March 8th, 27th.
Convallaria majalis—April 30th.
Rye—May 25th.
Barley—June 10th.


JANUARY
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JANUARY, 1878.

Days of Month	Mean Readg of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest	Adopted Mean.	Dew Point.	Highst insun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0--10)	Rain.
	in.	°	°	°	°	°	°					in.
1	30·308	44·0	32·9	38 5	37·6	54·3	19·6	S.S.E	S W.	58	10·0	
2	·392	47·8	42·0	45·3	45·0	54·4	36·3	W.	S.W.	78	10·0	·04
3	·174	47·6	38·2	43·1	42·5	56·0	30·3	S W.	W.	145	9.5	·45
4	·025	48·1	45·0	46·4	46·1	51·0	43·8	N.	N.	91	10:0	·03
5	30·146	45·8	41·6	43·2	42·2	45·7	41·1	E.	W.	64	10·0	·05
6	29 991	46·6	40·1	42·6	40·4	65·2	34·7	W.	W.	113	9·0	
7	·553	42·0	36·4	38 3	35·2	57·3	29·6	W.	S.W.	126	9·0	·09
8	29 936	39·9	34 5	36·6	34·0	61·5	30·2	N.E.	N.W.	203	8·0	·01
9	30·264	38·4	32 7	34·8	32·0	67·5	27·6	N.N.E	N.W.	131	7 5	
10	·410	48·8	30·0	36·2	31·2	70·0	24·1	N.W.	N.W.	101	8·5	
11	·671	42 4	25·5	30·1	25 2	74·7	13·9	E.	N.W.	16	0·5	
12	·687	35·3	25·4	31·8	31·8	37·6	13 6	W.	S.W.	79	10 0	
13	·600	44 5	34·2	39·8	38·4	52·8	27·7	W.	S.W.	120	9·5	·02
14	·409	50·0	42·6	46·1	45·0	75·0	36·7	W.	W.	237	10·0	
15	·360	51·0	36·0	44 6	44·1	60 0	35·4	W.	W.	210	8 5	
16	·322	49·5	40·9	45·1	43·0	76·3	30·2	W.	W.	238	8·0	
17	·463	49·2	35·0	40·5	38·4	88·8	23·1	N.W.	N.W.	83	5 0	·04
18	·517	45·6	41 7	42·9	41 6	57·0	37·7	E.	W.	10	10·0	·04
19	·463	46·0	41·2	42·7	41·4	73·1	32·4	S.S.E.	S.W.	54	10 0	
20	·314	49·1	41·3	45·7	45·6	50·7	36·3	W.SW	S.W.	209	10 0	·01
21	30·080	54·7	48·4	51·5	49·3	67 0	46·5	S.W.	W.	379	10·0	·17
22	29·988	54·0	46·2	49·6	46·6	60 3	41·9	W SW	S.W.	345	10·0	·12
23	·784	46·8	33 2	38·7	33·2	86·8	30·6	W.	S W.	314	9·5	·05
24	·559	42·1	33.6	36·4	33·6	57·4	26·8	W.	W.	221	4·0	
25	29·522	36 7	27·7	32·8	30·7	70·2	24·4	N.W.	W.	288	4 0	·15
26	30·070	43·3	31·2	34 5	29 2	89·8	21 2	N.W.	N.W.	104	1·0	
27	29·990	41·4	31·0	36 7	36 0	47 8	22 2	E.	S.	82	10·0	·49
28	29 830	44·6	32·7	38·5	36 7	80·5	23·0	S.	W.	169	5·5	·14
29	30·179	44·2	30·0	37·2	30·3	87·4	19·8	W.	W.	108	0·0	
30	·358	38·1	25·3	30 1	28·0	78·0	17 0	N.	W.	23	5·0	
31	30 562	37 9	27·4	31·4	28·2	71·1	17 3	E.N.E.	N.W.	58	0·0	
Mns	30·192	45 0	35 6	39·7	37 5	65·3	28·9	...	...	Sum 4460	7·5	Sum 1·90

FEBRUARY, 1878.

Days of Month.	Mean Readg. of Barometr reduced to Sea Level.	Temperature. In the Shade: Highest.	Lowest.	Adopted Mean.	Dew Point.	Highst insnn's rays.	Lowst on the grass.	Direction of the Wind. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10)	Rain.
	in.	°	°	°	°	°	°					in.
1	30·573	39 7	26 2	31·5	29·2	72·9	16·1	N.	W.	59	5·5	
2	·466	40 0	33 1	36·5	35·2	47·9	30 4	N	N.	52	10 0	·03
3	·473	41·5	35·5	38·2	36·3	46·4	32·6	N.	N.	62	10·0	
4	·581	41·9	37·7	38·9	37 0	47 2	35·4	N.	N.E	56	10·0	
5	·612	38 7	33·8	35·5	32·2	41·8	32·8	E	E.	60	10 0	
6	·595	38 7	30·6	33·5	31·7	71·5	30·5	E.	S E.	64	10 0	
7	·642	45 0	30 2	34 3	29 9	82 6	18·4	S E.	S.E.	24	3·0	
8	·591	43 9	24·8	31·7	28·3	79·0	15·9	N W.	N W.	57	5·0	
9	30 268	35·2	31·2	33·4	31·5	40 0	30·6	S.	S W.	65	10·0	09
10	29·958	45·8	34·3	40·2	40·2	54·3	31·6	S.W.	S.W.	69	10 0	·13
11	30.007	43 7	37·5	39·2	36·6	47·0	34·9	E.	S.E.	99	10·0	·03
12	30·164	42·2	33·5	36·8	34·5	87·5	27·7	S.E.	S.W.	111	10·0	·38
13	29·936	50·8	36·0	44·5	44 3	92·5	34·3	S W.	S.W.	213	10·0	·34
14	29·874	51·5	41 3	44·5	41·3	99·3	33·1	N.	W.	97	10·0	·05
15	30 091	50 2	38·1	46·9	43 7	70 0	31·4	S.	S W.	117	9·5	·07
16	·284	50·0	39 4	45·9	45·7	88·8	31 8	S W.	S.W.	217	10·0	
17	·127	57·7	46·1	49·8	45·7	99·0	39 5	S W.	S.	217	10·0	·02
18	·243	53·5	41·5	45·6	41·6	102·0	32·8	S W.	W.	221	1·5	
19	·412	48·1	37·3	41·7	39·7	89 3	26 9	W.	S.	91	8 5	·03
20	353	48 7	40·6	43 8	41·8	69·3	32·8	S.	W.	167	5·5	
21	·641	53·2	35 3	43 0	40·2	89·0	26 2	N.W.	W.	65	1·0	·01
22	·619	48 6	44·0	46·0	43 7	54·0	38 2	W.	W.	36	10·0	·01
23	·408	47·4	41·1	43·3	39·7	59·0	33·2	W.	W.	26	10·0	
24	·260	46·1	40·9	43·1	39·9	54·1	34 2	N.	S.W.	2.	10 0	
25	·181	52 7	41·4	45·7	42·4	98·8	36·0	W.	W.	151	10·0	
26	30·131	50·5	44·4	46·3	42·4	75·9	40·3	S.W.	S.W.	213	6·5	
27	29 819	49·8	44·3	46·6	45·0	69·2	40·2	S.W.	S.W.	230	10·0	·40
28	29·930	54·5	46 2	49 8	47 6	62·0	43·9	S.W.	W.	272	10·0	·26
Mns	30·294	46 8	37·4	41·3	38 8	70·7	31·8	...	...	Sum 3131	8·4	Sum 1·85

MARCH, 1878.

Days of Month.	Mean Readg. of Barometr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Dew Point.	Highest in sun's rays	Lowest on the grass.	Direction of the Wind. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10).	Rain.
	in.	°	°	°	°	°	°					in.
1	29·705	55·5	48·5	51·9	51·2	67 2	45·7	S.W.	S.W.	281	10·0	·32
2	30·086	56·7	45·3	49·5	42·5	113·9	35 9	W.	W.	173	5·5	
3	·468	56·7	36·2	44·8	42·1	105 6	25·6	W.	W.	106	2·5	
4	·516	53·9	41·0	46·3	41·7	101 9	28 7	S.W.	S.W.	177	9·0	
5	·508	54·1	36 4	44·2	40·3	103 1	27·3	W.	S.W.	153	5 5	·01
6	·114	53·0	41·3	47·8	43 0	84 0	40·2	S.W.	W.	474	7·0	
7	·061	56·7	40·4	48 2	43·7	106 0	29·9	S.W.	S.W.	269	2·7	
8	·145	50·6	41·1	44 7	35·0	92·9	32·1	N.W.	W.	303	5·5	
9	·161	48·0	38·2	42 2	38 1	85·6	31·7	E.	W.	109	10·0	·08
10	·119	52·9	40·7	45·2	40 6	101·3	30 1	W.	W.	142	4·5	
11	·290	51·9	37·1	44·9	42·2	91 8	26·8	W.	W.	216	10 0	·04
12	·310	49·5	40·9	44 3	42·6	85 0	30 9	N.	N.	121	8·0	
13	·450	45·1	35·1	38·9	31·0	97·8	28·4	N.	N.	112	9·5	
14	·514	47·0	26·8	36·4	30·0	106·3	17·8	N.	N.	38	9·0	
15	·504	43·6	29 5	36·6	31 8	76·0	20·4	N.	N.	40	9 5	
16	·676	41 6	30 2	35 2	26·3	107·4	21·7	N.E.	N.W.	127	4 5	
17	·590	47·8	26·3	37·3	32·3	79·1	17 6	N.W.	W.	83	9 7	
18	·378	55·5	40·4	47·3	42·3	91·1	36·6	W.	W.	135	10·0	
19	·372	54·3	41·7	46·3	39 9	100 8	32 5	N.W.	W.	126	7·0	
20	·454	56·3	38·8	46 5	39 7	109 0	30 2	W.	W.	79	10 0	
21	·286	55·5	42·2	46·5	40·4	106·4	36 3	W.	N.W.	96	7·5	
22	30·003	47·3	33·9	39·2	29 6	100 3	26 4	N.W.	N.W.	52	0 0	
23	29·789	44·0	24·3	34 0	28·4	102 0	14·4	N.W.	N.	124	0·0	·04
24	·597	46·1	27·7	35 2	30·8	101·6	21·8	N.	N.W.	1 ·4	5 0	·16
25	29·890	43 0	26 2	33·3	27·0	92 2	23 2	N.W.	N.W.	158	1·5	
26	30·101	49·1	25 6	37·0	30·5	109 4	15 1	N.W.	N.W.	147	0 0	·01
27	29 823	50·7	30·9	38·5	31·5	108 8	21·6	W.	N.W.	100	5·0	
28	·430	37 0	30·7	33·4	32 0	47·0	24 3	E.	N.E.	140	10 0	·62
29	·301	35·8	29·0	32·0	30·8	81 0	30·6	N.E.	N.E.	321	5·0	·19
30	·467	39·9	26 5	33·1	28·5	97·8	21·2	N.	N.	283	3 5	·03
31	29 403	41·1	27 9	36·6	32·7	94 2	20·3	W.	W.	136	10 0	·15
Mns	30·113	49·2	34·9	41·2	36·1	95·1	27·3	...	...	Sum 4945	6·4	Sum 1·65

APRIL, 1878.

Days of Month.	Mean Readg. of Baromtr reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Dew Point.	Highst insun's rays.	Lowst on the grass.	Direction of the Wind A.M.	P.M.	Velocity Miles	Mean amt. of Cloud (0-10)	Rain.
	in.	°	°	°	°	°	°					in.
1	29·249	47·5	25·8	35·9	30·2	105·8	19 0	W.	W.	270	0 0	
2	·411	49·8	31·3	40·4	33·2	107·9	27·2	W.	W.	315	0 5	
3	·546	43·9	35·7	39·3	35·3	63·9	28·7	S.S.W.	Calm	176	5·0	·14
4	·817	52·5	32·0	41·9	36·2	116·7	24 3	W.NW	W.	175	2·5	
5	29 943	52 0	32·6	41·1	35·1	111·2	25·0	W.	W.	11	4 0	.01
6	30·154	55·0	29 3	42·6	36·9	114 2	24 1	N.N.E	S.W.	26	1·5	
7	30 100	55·2	31 3	41·9	34·8	108·3	25·3	S.E.	S.E.	173	0 0	
8	29 925	57·1	36 9	42 6	33·5	115·8	30·7	E.	E.	240	5·0	
9	·969	52·7	37·2	44 8	36·1	107·3	30·2	E.	E.	279	5 0	
10	29 886	48·3	41 3	44·0	40 0	59·3	40·4	E.	E.	340	10 0	.58
11	30·047	51·7	44·1	47 4	44·1	81·0	43 3	E.	E.	174	10 0	
12	·134	62·0	37 9	50·1	43 8	113·9	30 2	E.	S.	85	8·5	
13	·015	52·2	45·2	48·9	46 1	67·1	41·3	S.	S.	130	10 0	·19
14	·009	55·6	48 3	51·0	49·0	79·0	43·3	S.	S.	169	5 0	
15	30·020	59 7	45·0	51·6	48·6	109·0	38 9	S.W.	S.W.	92	5 5	
16	29·825	58·1	45·2	51 2	48·2	92·0	41·2	S.	W.	100	10 0	·05
17	·748	56·7	34·5	46·9	45·2	108·0	36·2	W.	W.	123	5·5	·09
18	·782	62·1	37·0	48·7	45·4	115·0	34·4	W.	W.	58	7·0	·11
19	·665	61·7	45·4	52·7	50·3	121·8	46 2	W.	S.	145	10·0	·28
20	·536	55·0	47·0	49·8	47·5	85·0	41·2	S W.	S.W.	125	5·0	·56
21	·682	56·0	43·4	48·8	43·9	104·8	38·1	S.	E.	130	3·0	·08
22	·820	58·1	34·0	47·0	45 3	105·7	29·4	E.	E.	52	4·0	·08
23	·599	58·7	43·0	49·9	46 0	109·5	38·9	E.	E.	185	10·0	·05
24	·641	57·5	47·2	50·8	47 2	70·5	45·9	E	E.	178	10 0	·09
25	29 909	59·9	42·2	48·6	41·3	114 0	36 6	N.E	E.	196	4·0	
26	30·114	58·9	39·9	47·6	39 7	114·9	35 2	N.E.	E.	132	3 5	
27	·221	62·6	40·3	50·4	39·5	121 6	30·9	N.E.	E.	97	1 0	
28	30·135	63·6	36·4	51·1	43 3	123·0	30·0	E.	E.	79	0 0	
29	29·841	63·2	42 4	53·0	47·6	98·5	37 7	E.S.E.	S.W.	157	9·5	·40
30	29 645	65 0	50 3	56 6	53·2	116·2	50 3	S.W.	S.W.	148	10.0	08
Mns.	29·846	56 4	39 1	47·2	42·2	102 0	34 6	...	...	Sum 4560	5 5	Sum 2·59

MAY 1878.

Days of Month.	Mean Readg. of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Dew Point.	Highst insun's rays	Lowst. on the grass.	Direction of the Wind. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10).	Rain.
	in.	°	°	°	°	°	°					in.
1	29·671	64·9	51·9	55·9	52·0	115 9	44·2	S.	W.	72	4·5	·03
2	29·953	64·0	47·3	54·4	51·7	113·8	41·6	W.	S.W.	97	10·0	
3	30·043	63·2	49·8	54·7	50·6	115·8	46·3	S.W.	W.	133	7·0	·01
4	30 136	61·7	40·4	50·7	45 3	112 6	31·6	W.	W.	112	4·0	
5	29·995	66·7	44 0	55·4	46·7	117 8	31·4	E.	E.	85	0·5	
6	·661	59·5	45·3	53·6	52 0	86·4	40·2	E.	S.E.	163	10·0	·11
7	·703	65·2	49·8	56·2	50·6	111·5	45·7	W.	W.	75	9·5	·08
8	·713	58·3	46·3	50·9	47·7	94·3	39·4	W.	E.	50	6·5	
9	·859	64·6	42·7	53·8	47·8	125·8	35·6	E.	E.	109	7·0	
10	·748	69·8	46·4	57·2	53 3	127·1	40·6	E.	S.	121	8·0	·88
11	·616	64·7	53·0	56·8	53·0	124 2	49·5	S.	E.	198	9·0	·05
12	·639	67·9	51·3	59 2	50·4	130·3	46·3	S.W.	S.E.	153	8·5	·10
13	·559	59·6	50·4	54·4	49 6	116·0	46·4	S.W.	S.W.	176	9·5	·17
14	·518	61·0	49·0	53·7	49·1	117·8	47·4	S.W.	S.W.	191	9·0	·31
15	·497	58·6	49·9	53·4	49·6	101·5	46·6	S.W.	S.	259	10 0	
16	·778	60·0	48.6	55·4	52·4	113·0	42·6	S.	S.W.	170	8·5	·57
17	·958	65·7	55·1	58·9	55·5	122·3	54·8	S.W.	S.W.	335	10·0	·08
18	·864	69·6	51·0	59·1	53·0	123·8	47·7	S.	S.W.	188	1·5	·06
19	·899	61.1	48·0	54·0	46·8	115·7	43·9	S.W.	S.W.	275	9·0	·19
20	·c84	57·0	45·1	49·5	44·4	116·0	44·2	S.W.	S.W.	489	9·5	·12
21	·965	54 9	36·4	47·0	40·6	113·5	33·8	S.W.	S.W.	336	5·0	·11
22	·930	59·7	41·1	50·9	42 9	122·1	34 9	S.W.	W.	137	8.5	·53
23	·416	60·6	44·8	52·4	48·5	95·9	45·7	S.W.	S.W.	224	9·5	·02
24	·370	60·6	48·6	53 2	45·8	118·1	47·7	S.W.	W.	97	8·0	.15
25	·736	58 8	42·2	50·1	43·4	119 1	38 9	S.W.	S.W.	1·7	8·0	·09
26	·828	61·7	46·7	51·4	46·4	112·5	41 6	S.W.	S.W.	118	10 0	·15
27	·804	59·0	44·5	51·1	47·3	115·1	40·5	S.	W.	125	5·0	·05
28	29·851	62·6	41·5	52·3	49·0	113·4	33·4	N.E.	N.	72	9·5	·40
29	30·068	56·0	47·4	50·9	47·8	71 0	45·9	E.	E.	94	7·0	
30	·146	59·5	42.1	50·0	45·3	120·2	36·6	E.	E.	76	7 0	
31	30·003	66·1	35·3	53·1	49·0	120 3	33·3	E.	N.E.	45	5 0	
Mns	29·801	62·0	46·3	53·5	48 6	113·6	42·0	...	...	Sum 4908	7·5	Sum 4·26

JUNE, 1878.

Days of Month.	Mean Readg. of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Dew Point	Highst insun's rays.	Lowst on the grass.	Direction of the Wind A.M.	P.M.	Velocity Miles	Mean amt. of Cloud (0–10)	Rain.
	in.	°	°	°	°	°	°					in.
1	30·034	56·7	49·9	52 0	49·0	85·3	46 5	N.E.	N.E.	81	10 0	
2	30·000	60 7	46·0	53·5	45·4	93·0	41·0	E.	S.	89	9 5	·02
3	29·940	66·9	51·4	58·0	52 9	110 0	50·6	N.W.	W.	47	9·0	·38
4	29·818	62·6	51·6	57·0	51·7	105·9	48 6	W.	W.	154	9·0	·80
5	30·122	57·5	49·1	52·3	49·6	79·9	44·5	N.E.	N.W.	60	9·5	·01
6	·247	67·8	45 3	57·2	50·3	118 6	39 3	W.	W.	80	5·0	
7	30·099	68 0	49 6	58·3	51·8	123·5	44·9	S.W.	S.S E	75	9 5	
8	29·702	69·9	50 7	60 0	54·6	122·2	47·7	S.S.E.	S.W.	110	7·0	·02
9	·590	63·4	51·5	56·1	51·9	119·0	49·0	S.	S.W.	187	9·5	·16
10	·791	63·9	48 9	55·9	50 1	128·9	45 7	S W.	S.W.	483	5·5	.46
11	·543	60 9	50·7	54 0	49·8	114·8	46·5	S.W.	S.W.	450	5·5	·13
12	·664	60·9	47·1	54·6	51·0	119·9	43·0	S.W.	S.W.	213	9·5	·44
13	·856	64·7	48·0	56·5	51·1	119 0	45·8	S.W.	E	88	8·0	·36
14	·926	57·5	47·2	51·1	44·3	121·8	49·4	N.E.	N.E.	124	10 0	
15	·888	62·9	41·6	52·5	44 5	122·8	37·3	N.E.	S.E.	39	2 0	
16	·844	66·7	47·8	56 0	50·0	128·4	43·3	N.	N E.	62	9 0	·24
17	·887	63·6	46·9	54·3	50·4	115·9	43·7	N.	N E.	35	10·0	·32
18	29·937	65·3	46·3	55·7	51·4	123·3	42·2	E.	N.W.	23	8·0	·67
19	30·021	69·7	46·5	58·2	51·3	130·7	42·5	N.W.	W.	52	8·5	
20	·081	71·0	52·3	60·5	51·3	132·7	45·0	S.	S.	72	2·5	
21	·142	73·3	48·9	61·5	49·9	135·0	42·9	S.	S.W.	81	4·0	
22	·186	77·4	49·4	64·6	53·7	137·9	48·4	S.	S.W.	40	2·0	
23	·095	77·6	60·1	68·2	58·9	138·6	50·9	E.	S.	20	7·0	
24	·124	79·7	55·5	67·7	58·6	136·0	51·8	W.	S.W.	48	5·5	
25	·195	80·0	60·0	68·8	57·2	132·3	58·7	W.	S.W.	39	5·5	
26	·175	84·8	55·2	71·7	63·2	139·0	52·8	S.	S.	56	1 0	
27	30·044	84·7	60·9	73·6	63 2	139 3	55·6	S.E.	E.	93	0 0	
28	29 914	82·7	60·6	71·2	63·1	137·0	57·7	E.	N E.	162	0·5	
29	·845	78 7	60 6	67·2	59·1	135·9	52·5	N.E.	N.	99	5·0	·29
30	29·880	70 7	55·5	60·8	56·4	131·7	52·5	N.	W.	69	9.0	·18
Mns.	29·953	69 1	51·2	59 6	52·9	122·6	47·4	...	...	Sum 3231	6 5	Sum 3·98

JULY, 1878.

Days of Month.	Mean Readg of Baromtr reduced to Sea Level.	Temperature. In the Shade. High-est.	Low-est.	Adopted Mean	Dew Point	Highst insun's rays.	Lowst on the grass.	Direction of the Wind. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10).	Rain.
	in.	°	°	°	°	°	°					in.
1	29 921	65 0	55 9	58·7	55·1	110·0	57·6	N.E	N.E.	60	10·0	1·16
2	29·897	61·5	50·9	54·4	51·0	113·8	51 6	N.E.	N.E.	85	9·5	·03
3	30·036	64 8	51·0	57·1	50·9	122·5	50·1	N.	N	50	9·0	·06
4	·173	69 7	48·7	58·5	52·9	127·4	40·7	N.	W.	79	5·0	
5	·107	66 7	53 3	60·9	57·1	93·6	50·5	N W.	W.	111	9 5	
6	·051	73·8	57 5	63·1	56·5	135·0	54·4	S W.	W.	152	6 0	
7	·040	73 8	54 1	62 6	56·2	135 8	50·5	W.	W.	118	5·5	
8	·145	70 7	53·1	61·9	53·3	139·0	49·7	N.	W.	45	5·5	
9	30 049	70·9	51·7	61 7	55·0	124 1	49 7	W.	W.	90	6·5	01
10	29 973	67·8	51·9	59·0	51·5	131 9	47·8	W.	W.	116	8·0	
11	.934	66 5	54·2	59·0	51·5	123·6	51·8	W.	W.	137	8·5	
12	29·904	67·2	51·4	59·6	52·9	118·5	46·4	N.W.	N.E.	106	9·5	·38
13	30·011	71·6	53·0	62·1	54 2	129 0	51·1	N.E.	N.	53	5·5	
14	·149	68·5	49·4	58 8	52·4	128·7	44·1	N.	N.	68	4·5	
15	·258	66·6	52·3	58·6	53·8	103·0	47·4	N.	N.	67	5·0	
16	·318	72·1	50·3	62·4	59 0	119·0	46·9	N.	N.	36	5·5	
17	·331	80·7	52·4	68·3	61·3	130·2	49·7	N.	N.	30	0·5	
18	·367	78·8	60·1	69·4	62·6	135·4	54 7	N.	E.	64	2·0	
19	·256	83·9	59·6	68·4	63·7	128·9	56 2	E	E.	42	2 0	
20	108	82·1	57·6	69·8	60·6	138·5	54·4	E.	E.	109	4·0	
21	·022	82·2	59 9	70 1	60·6	135·0	55·7	N.E.	N E.	116	1·0	
22	30·020	80·1	58·1	67·9	63 6	137·0	54·1	N E.	E.	63	6·5	·23
23	29·944	74·7	62 6	66·1	61·9	138·4	59 4	E.	E.	111	9·5	·28
24	·719	74·3	58·8	64·0	60·0	133·8	60·4	S.	S	110	9·5	·46
25	·761	67·7	56·1	60·4	55·1	118·3	57·2	S.W.	W.	124	10 0	
26	·819	70·3	51·6	61 0	57·1	130 8	49·8	S.W.	W.	93	8·5	
27	·956	72·0	55·3	61·5	52·8	132·3	52·6	N.W.	W.	79	5·5	
28	29·989	69·7	45·2	57·1	53 3	130·8	41·2	N.	N.	50	5·5	
29	30·092	73·8	46 6	60·0	53·4	137·9	46·2	S.	N.	45	2·5	
30	·255	70·6	46·4	58·1	54·1	126·4	43·7	N.	N.E.	70	4·0	
31	30·382	66·9	48·6	57·8	54·6	113 7	42·7	N E.	E.	79	3·5	
Mns	30 064	71·8	53·3	61·9	56 1	126·6	50·6	...	...	Sum 2558	6 0	Sum 3·61

AUGUST, 1878.

Days of Month.	Mean Readg. of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest	Adopted Mean.	Dew Point.	Highst. insun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10)	Rain.
	in.	°	°	°	°	°	°					in.
1	30·251	69·9	48·0	57·3	52·6	124·8	41·0	E.	N.	151	5·0	
2	29 969	71·5	52·1	59·6	53·9	127 0	49·1	N.	N.E.	189	5·5	
3	·761	69·9	55·4	60·8	56·0	131·7	50·8	N.E.	N.E.	106	7·5	·12
4	·794	65·5	51·4	58·7	57·1	103·5	46·7	N.	S.W.	44	9·0	·29
5	·852	74·6	55·9	63·5	59·0	134·5	55·0	S.	S.W.	142	9·5	·18
6	·723	73·6	60·1	64·5	60·4	136·8	55·5	S.	S.W.	74	7·0	
7	29·875	72·7	57 9	64·2	59·3	133·5	53·6	S.W.	S.W.	147	5·5	·24
8	30 119	73·3	57·5	64·5	58·3	131·2	50·4	S.W.	N.W.	94	7·5	
9	30·060	73·2	57·2	64·7	56·2	133·5	46·5	S.	S.	82	7·5	·03
10	29 701	74·3	58·1	64·6	59·0	136·2	57·3	S.	S.	112	9·5	·01
11	·797	72·6	51·2	62·3	54·2	134·3	45·5	S W.	S.W.	136	6·0	·39
12	·629	71·6	54·3	61·6	54·6	128·9	49·9	S.W.	S.W.	188	4·5	·10
13	·631	66·1	54·0	59·3	56·0	106·6	49·4	S.W.	S.W.	147	10·0	·95
14	·524	70·6	56·9	62·3	57·0	130·0	55·7	W.	S.W.	253	5·0	·01
15	·590	71·8	55·2	61·9	53·9	136·2	49·8	S.W.	S.W.	96	5·0	·41
16	·492	68·3	53·8	59·9	53·4	122·8	51·1	S.W.	S.W.	136	3·5	·11
17	29·973	66·5	52·5	58·7	50·9	114·0	42·1	S.W.	S.W.	130	7·5	
18	30·040	72·5	52 1	61·4	55·8	127·0	46·8	S.W.	S.	99	9·0	
19	29·890	73·8	57·5	64·0	56·0	131·0	52·7	E.	E.	64	9·5	
20	29 966	66·7	57·0	60·0	53·9	112·0	52·3	E.	E.	95	9·5	
21	30·022	66·7	51·9	58·2	54·3	125 7	47·0	E.	S.E.	110	10·0	·10
22	29·857	67·7	50·8	59·5	54·4	109·2	44·8	E.	E.	162	7·0	1·44
23	·497	72 7	56·8	61·8	57·9	135·5	52·9	E.	N.	109	5·0	·02
24	·496	70·6	57.9	62·0	57·0	130 7	49·5	N.	N.W.	38	9·0	
25	·539	70·9	52·8	60·2	55·6	135·0	50·3	N.W.	E.	41	5·0	
26	·549	71·5	49 9	61·6	58·0	123·5	50·5	E.	S.W.	59	6·0	
27	·675	71·9	57·5	62·8	57·1	129 7	54·6	S.W.	S.W.	131	6·5	·13
28	·796	70·5	53·9	60·8	55·3	125·2	51·4	S.W.	S.W.	170	5·0	·15
29	·549	68·0	55·3	60·6	57·0	112·0	53·7	S.W.	S.	110	10·0	·73
30	·488	68·7	56·6	60·7	56·7	126·0	55·5	S.W.	W.	165	5 0	·11
31	29·772	65·9	54·4	58·1	54·4	120·1	52·4	W.	S.W.	162	5·5	
Mns	29·770	70·4	54 7	61·3	56·0	126·1	50·4	...	...	Sum 3742	7·0	Sum 5·52

SEPTEMBER, 1878.

Days of Month.	Mean Readg. of Barometr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Dew Point.	Highst insun's rays	Lowst. on the grass.	Direction of the Wind. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10).	Rain.
	in.	°	°	°	°	°	°					in.
1	30·141	62·4	52·7	57·4	51·9	89·5	48·8	N.W.	W.	107	9·0	
2	·307	66 7	50·2	57·8	51·0	120·8	48·8	W.	W.	56	3·5	
3	·259	71·6	51·9	60·9	56·1	128·0	47·5	W.	S.W.	42	3·0	
4	·128	69·7	49·7	60·2	55·4	125 1	48·3	N.E.	N.E.	74	5·0	·08
5	·032	71·6	60·1	64·3	60·5	116·0	57·6	N.E.	W.	70	6·0	·01
6	·154	71·8	55·0	62·3	56 0	124·1	50·0	W.	S.W.	56	0·5	
7	·136	72·9	50·9	62·5	58·7	135·3	47·8	S.W.	N.W.	30	9·0	·18
8	·059	71·7	57·2	62·0	58·4	122·1	53·6	N.W.	W.	38	9·5	
9	·107	69·7	54·6	61·4	58·6	118·5	51·7	W.	N.	74	10·0	
10	·281	67·7	49·1	57·4	51·0	118·2	43·9	N.	N.	61	0·5	
11	·265	73·4	43·0	58·0	54·1	122·0	39·4	N.	N.	23	0·5	
12	·166	68·0	47·1	57 2	50·7	115·0	40·7	W.	N.	110	4·5	
13	·126	67·0	42·0	54·7	50·8	125·0	35·8	N.	N.	48	2·0	
14	30·034	68·9	41·2	56 8	55·5	118·2	34·4	S.W.	S.W.	74	7·0	
15	29·700	63·5	51·1	57·0	54·1	97·2	46·0	S.W.	S.W.	214	10·0	·16
16	·951	61 0	46.6	53·2	47·0	115·0	38·2	W.	S.W.	227	1·5	
17	·976	63·7	48·7	57·4	56·5	86·3	42·7	S W.	S.W.	208	10·0	·25
18	·760	61·7	47·7	54·0	51·8	111·4	42·2	S.W.	S.W.	189	5·0	·01
19	29·885	60.8	41·3	51·8	48·0	119 7	33·7	S.W.	N.W.	182	3·5	·23
20	30·026	59·7	40·4	48·9	44·8	117·0	34·3	N.W.	N.W.	65	3·0	·08
21	30·187	62·7	34·7	49·8	45·1	119·8	29·9	N.W.	S.W.	41	9·5	
22	29·742	59·7	47·6	52·7	47·0	97·4	44·0	S.W.	N.W.	131	10·0	·63
23	·523	60·0	40·0	48·5	43·6	119·7	34·9	N.	N.W.	96	3.5	·02
24	·726	60·5	32·7	46·9	43·0	110·0	29·7	S.	S.W.	56	1·0	.02
25	29·743	59 5	41·7	50·5	48·3	72 5	33·7	S.	N.W.	57	8·0	·11
26	30·050	60·0	36·5	47·5	43·4	113·0	28 6	W.	S.W.	105	4·5	
27	·131	62·6	41·8	54·4	52·1	109 9	33·0	S.W.	S.W.	106	9 0	
28	30·113	67 0	54·0	58·6	54·8	120·2	47·4	S.W.	S.W.	63	10·0	
29	29 997	68·7	50·1	57·3	53·0	124·0	42·9	S.W.	S.W.	56	5 0	·03
30	29·813	62·5	51.5	55·7	49 2	114·2	44·8	S.W.	S.W.	218	4·5	
Mns	30·018	65·6	47·0	55·9	51·7	114·2	41·8	...	...	Sum 2867	5·6	Sum 1·76

OCTOBER, 1878.

Days of Month.	Mean Readg. of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest	Adopted Mean.	Dew Point.	Highst. insun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0.–10)	Rain.
	in.	°	°	°	°	°	°					in.
1	30·111	63·9	42·4	52·1	49·0	114 0	34·2	N.	N.W.	78	5·5	
2	·301	61·7	45·4	53·9	47·2	115·2	42·3	E.	S.	89	5·0	
3	·218	67·4	49·1	57·2	51·9	120·4	41·3	S.W.	S.	50	5·5	
4	·156	65·7	47·3	56·7	52·1	105·4	37·6	S.	S.W.	76	8·5	
5	30·070	72·6	48·1	59·3	51·9	118·7	41·6	E.	S.	90	6·0	
6	29·742	67·5	55·6	60·4	57·8	113 3	49·2	S.	S.	131	10·0	·57
7	·448	63·9	55·8	59·5	54·9	116·0	52·4	S.	S.	174	9 0	·08
8	·463	64·2	54 0	57·6	53·4	118·2	48·0	S.W.	S.	187	5·0	
9	·475	58·7	51·2	56·1	53·6	69·6	44·2	S.	W.	260	10·0	·83
10	29·393	59·6	51·1	54·8	50·5	95·9	48·3	S W.	S.W.	312	9·0	·14
11	30·029	58·4	41·9	48·6	42·4	109·4	32·9	S.W.	W.	193	4·5	
12	·321	62·5	37·6	48·2	41·9	115·1	29·2	S.	S.	15	3·5	
13	·278	60·0	33·2	47·8	45·1	113·0	26·8	S.E.	S.E.	91	2·0	
14	·099	59·9	41·2	49·2	44·2	107·2	31·6	E.	N.E.	113	0·5	
15	·028	59·4	37·3	48·3	47·9	67 0	29·4	N.E.	N.E.	55	9 5	·01
16	30·093	54·7	49·3	51·4	50·2	61·1	48·8	N E.	N.	25	10·0	
17	29·992	60·7	44·5	50·1	47·2	103·4	43·6	E.	E.	42	5·0	
18	·818	56·7	47·3	50·8	46·0	101·2	43·4	N.E.	E.	156	10·0	
19	·795	55·7	48·0	51·6	48·9	67·8	43·6	E.	E.	88	10·0	·43
20	·801	57·5	47·8	51·2	49·3	72·2	41·7	N.E.	E.	39	5 0	
21	·379	60·8	48·8	54·3	51·3	107·2	47·6	S.W.	S.W.	86	9·5	·40
22	·307	55·6	42·4	47·4	42·6	101·9	36·6	S.W.	S.W.	259	6·0	·16
23	·604	52·7	39·4	45·0	40·9	103·2	33·6	S.W.	S.W.	106	5·0	·60
24	·277	57·1	44.0	50·2	47·5	92·9	38·7	S.W.	S.W.	195	5·0	·17
25	·253	54·1	42·0	46·9	41·8	98·0	36·2	W.	S.W.	194	3 0	18
26	·172	50·7	39·2	44·1	41·6	82·0	31·1	S.W.	S.W.	100	8·0	·04
27	·622	52·1	34·2	42·9	40·3	94·6	27·7	S.W.	S.W.	55	4·5	
28	·766	52·0	37·2	43·9	38·8	98·4	28·7	S.W.	W,	140	4·5	·04
29	·858	45·7	35·3	39·4	35·0	74·8	31·0	N W.	S.W.	177	6·0	·06
30	·777	45·8	30·9	38·5	35·3	82·4	25·4	W.	W.	203	6·0	·12
31	29 946	44·9	32·0	37·8	36·0	83·2	24 3	N.W.	N.	77	10·0	·18
Mns.	29·793	58·1	43·7	50·1	46·3	97·5	37·8	...	...	Sum 3859	6·5	Sum 4·01

NOVEMBER, 1878.

Days of Month.	Mean Readg. of Barometr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Dew Point.	Highst insun's rays.	Lowst. on the grass.	Direction of the Wind. A.M.	P.M.	Velocity Miles.	Mean amt. of Cloud (0-10)	Rain.
	in.	°	°	°	°	°	°					in.
1	30·049	48·3	35·4	39 9	36·7	88·8	30·9	N.	N.W.	75	2·0	
2	·249	43·2	32·3	37·3	34·6	80·5	25·6	N.	N.W.	43	0·5	
3	30·200	46·9	31·2	36·6	32·9	92·6	23·6	N.W.	N.	81	4·5	
4	29·810	47·0	30·0	38·5	35·9	92·0	22·3	N.	N.	104	5·0	
5	·860	44·6	34·0	37·4	32·6	76·2	25·4	N.	N.	93	0·5	
6	·667	45·7	31 5	38·7	32·6	85 9	22·9	N.W.	N.	147	2·5	
7	·822	47·6	30·4	36·4	30·3	89·9	22·5	N.	N.	126	0·5	·27
8	29·647	43·9	30·4	36·5	32·8	82·9	21·5	S.W.	W.	227	6·0	·04
9	30·157	48·3	31·8	38·7	32·0	91·8	24·3	N.W.	W.	122	0·5	.62
10	29 410	50·9	38 0	44·9	43·7	52·2	34·4	S.W.	W.	276	10·0	·80
11	·515	46·8	35·5	39·4	35·1	96·9	29 7	W.	W.	229	6·5	·12
12	·410	37·1	28·6	32·2	28·1	47·0	26·3	S.W.	W.	64	9·5	
13	·525	38·9	31·5	35·3	32·1	61·0	27·0	N.	N.W.	106	9·0	·41
14	·592	41·9	34·2	36·6	33·2	50·5	27·7	N.	N.W.	156	6·0	·26
15	·363	41·7	34·2	38·3	37·0	43·8	28·0	N.W.	N.W.	255	10·0	·39
16	·400	43·6	37·3	39 8	35·7	65·8	29·3	N.W.	W.	171	10·0	
17	29·670	44·0	38·1	41·2	36·8	55·0	31·3	W.	W.	145	9·5	·03
18	30·123	46·1	37·3	41·6	39·4	72·5	29·9	N.	N.	199	9·5	
19	·485	44·5	32·1	38·0	37·5	84·1	29·1	N.E.	N.	89	5·0	
20	·382	41·8	36·6	38·3	35·8	50·0	35·2	N.	N.	85	9·5	
21	·160	39·9	35·9	37·5	34·5	50·0	30·9	N.E.	N.	112	9·5	
22	30 087	38·3	34·8	36·1	31·4	40·9	34·5	N.	W.	55	10·0	
23	29·978	37·1	25·0	30·7	28·7	61·0	18·5	W.	N.	74	10·0	·10
24	·443	51·7	33·2	42·9	43·0	52·0	31·6	E.	S.W.	117	10·0	·14
25	·407	52·0	35·2	41·8	38·2	51·2	28 6	W.	N.	133	10·0	·04
26	·510	40·9	35·1	37·1	35·2	48·0	30·5	N.	N.W.	46	9·5	
27	·454	37·0	33·9	34·9	33 7	40·0	30·5	N.	N.	60	10 0	·35
28	·707	40·2	34·4	37·3	33·2	41·8	34·5	N.E.	N.W.	247	10·0	
29	29·988	39 9	29·2	33·3	29·9	69·0	24·1	N·W.	N.	102	6·0	·03
30	30·003	39·1	33·2	35·6	33·4	45·2	31·5	E.	N.	39	9.5	·03
Mns	29·802	43·6	33·3	37 8	34·5	65·1	28·1	...	...	Sum 3778	7·0	Sum 3·63

DECEMBER, 1870.

Days of Month.	Mean Readg. of Baromtr reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Dew Point.	Highst insun's rays.	Lowst on the grass.	Direction of the Wind. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10).	Rain.
	in.	°	°	°	°	°	°					in.
1	29·787	44·1	33·3	38·0	36·7	76·7	27·6	W.	N.W.	109	10·0	·20
2	30·076	40·2	33·1	35·3	32·9	50·6	23·6	N.	N.	66	4·5	
3	·209	36·9	32·5	34·7	33·2	44·9	25·4	N.	N.	100	9·5	
4	·306	37·9	29·7	33·7	28·2	58 0	22·0	N.	N.W.	66	6·0	
5	·152	44·2	30·9	36·1	33·9	80·3	23·9	W.	N.W.	101	6·5	
6	30·041	37·0	26·0	31·5	28·1	61·0	17·6	N.W.	N.	150	5 5	·02
7	29·691	37·4	31·5	34·1	32·8	48·2	26·9	N.	N.	135	9·5	·01
8	·576	33·3	27·8	30·4	27·7	50·4	23·6	N.	N.	80	9·5	
9	·725	3·77	23·7	27·6	24·5	57·3	18·4	N.	N.	46	1·0	
10	·886	27·3	20·2	24·7	24·7	34·0	15·5	N.	N.	48	10 0	
11	.923	31·0	25·2	28·2	28·1	36·0	26·7	N.	N.	38	10·0	
12	·777	30·9	23·1	26·1	25·3	32·5	25·9	N.	N.E.	43	10·0	
13	·683	30·0	22·0	25·9	35·2	54·2	18·5	E.	N.E.	75	10·0	
14	·684	28·0	21·3	24·1	23·2	48·8	17·6	N.E.	N.W.	82	10·0	
15	·682	36·7	21·1	29·5	27·7	45·6	14·7	W.	W.	93	8·0	
16	·513	34·3	29·1	31·5	30·7	40·5	22·4	W.	N.W.	42	10·0	
17	·549	32·2	28·0	26·5	23·3	42·9	17·6	N.	N.W.	40	4·5	·05
18	·318	38·8	24·1	32·5	31·4	62·8	16·6	W.	W.	278	4·5	
19	·342	39·9	29·7	32·9	30·0	72 0	24·6	W.	W.	133	8 0	
20	·596	35·9	21·7	26·2	23·5	56·8	16·6	W.	W.	28	0·5	
21	·877	35·1	23·8	27·1	24·5	60·1	16·6	N.W.	W.	134	0·5	
22	29·844	36·0	23·8	29·1	28·4	44·5	21·9	S.W.	W.	42	4·0	
23	30·005	32·6	19·3	23·3	20·6	49·3	12·3	W.	N.W.	11	0·5	
24	30·383	35·3	14·8	20·4	15·8	66·2	10·5	N.W.	N.	47	0·0	
25	29.873	33·0	14·0	25·8	25·8	40·0	10·3	E.	S.E.	80	5·0	·64
26	·439	45·5	32·1	40·1	40·1	49·2	31·9	W.	W.	109	10·0	·17
27	·413	45·8	33·7	39·6	38·9	44·0	33·4	W.	S.W.	152	10·0	·20
28	·536	45·2	36·7	40·4	38·1	53·1	28·7	S.	S.W.	97	9·5	·21
29	.479	47·1	37·2	42·1	41·0	82·0	29·9	S.W.	S.W.	177	10·0	·25
30	·497	52·5	44·2	49·1	47·9	63·8	41·4	S.W.	S.W.	210	9·5	·11
31	29·560	53·7	45·2	49·0	46·5	60·0	41·8	S.W.	S.W.	422	9·0	·21
Mns	29·755	37·9	27·5	32·1	30 3	53·7	22·7	...	...	Sum 3257	6·8	Sum 3·07

1878.

SUMMARY.

Month.	Mean Reading of the Barometer (reduced to Sea Level.)	Temperature. In the Shade. Highest.	Lowest.	Mean of all the Highest.	Mean of all the Lowest.	Adopted Mean.	Dew Point.	Mean of all the Highest in the Sun's rays.	Mean of all the Lowest, on the Grass.	Degree of Humidity (Saturation=100).	Wind. Direction. Proportion of N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Velocity.	Amount of Cloud.	Rain. No. of Days it fell.	Amount Collected.
	ins.	°	°	°	°	°	°	°	°										Miles.			ins.
January	30·192	54·7	25·3	45·0	35·6	39·7	37·5	65·3	28·9	95	2	1	2	1	1	6	13	5	4460	7·5	16	1·90
February ...	·294	57·7	24·8	46·8	37·4	41·3	38·8	70·7	31·8	94	4	0	2	3	2	9	6	2	3131	8·4	14	1·85
March	30·113	56·7	24·3	49·2	34·9	41·2	36·1	95·1	27·3	85	6	2	1	0	0	4	11	7	4945	6·4	11	1·65
April	29·846	65·0	25·8	56·4	39·4	47·2	42·2	102·0	34·6	85	1	1	11	1	5	4	7	0	4560	5·5	15	2·59
May.....	·801	69·8	35·3	62·0	46·3	53·5	48·6	113·6	42·0	85	0	1	7	1	3	13	6	0	4908	7·5	22	4·26
June	29·953	84·8	41·6	69·1	51·2	59·6	52·9	122·6	47·4	80	2	5	3	2	5	7	4	2	3231	6·5	15	3·98
July...	30·064	83·9	43·7	71·8	53·3	61·9	56·1	126·6	50·6	83	9	5	5	0	1	2	7	2	2558	6·0	8	2·61
August	29·770	74·6	48·0	70·4	54·7	61·3	56·0	126·1	50·4	87	3	1	6	0	4	14	2	1	3742	7·0	19	5·52
September ...	30·018	73·4	32·7	65·6	47·0	55·9	51·7	114·2	41·8	87	4	2	0	0	1	12	6	5	2867	5·6	13	1·76
October	29·793	72·6	30·9	58·1	43·7	50·1	46·3	97·5	37·8	89	2	3	4	1	6	11	3	1	3859	6·5	16	4·01
November ...	·802	52·0	25·0	43·6	33·3	37·8	34·5	65·1	28·1	91	13	1	1	0	0	2	6	7	3778	7·0	15	3·63
December ...	29·755	53·7	14·0	37·9	27·5	32·1	30·3	53·7	22·7	96	10	1	1	1	0	5	8	5	3257	6·8	11	2·07
Year	29·950	84·8	14·0	56·3	42·0	48·5	44·2	96·0	37·0	88	56	23	43	10	28	89	79	37	45296	6·7	175	35·83

SUMMARY OF THE WEATHER FOR 1878.

JANUARY

" At new year's tide
The days lengthen a cock's stride "

The weather from the 1st to the 22nd, with the exception of the 11th and 12th, was mild, but on the 23rd a cold period set in which continued till February 9th. The highest temperature during the month was 54°7, on the 21st, the lowest 25°3 on the 30th, and the mean 39°7. Atmospheric Pressure was very high; the highest 30·702 in. occurred at 9 a.m. on the 13th, and the lowest 29·379 in. at 9 a.m. on the 25th; the mean was 30·192 in. Rain fell on 16 days, the total amount being 1·90 in. which is considerably below the average. Fog occurred on 7 days; snow fell on the 23rd and 25th; and a lunar halo was seen on the 19th.

FEBRUARY.

" You should on Candlemas-day
Throw candles and candlesticks away."

The first nine days were cold, but from the 10th to the end of the month the weather was mild. Owing to the cloudy state of the sky the mean range of temperature was small. The maximum temperature 57°7 occurred on the 17th, and the minimum 24°8 on the 8th; the mean for the month was 41°3.

Atmospheric pressure continued very high, the readings on 8 days exceed 30·5 in.; the highest 30·660 in. took place at 9 p.m. on the 21st, and the lowest 29·706 in. at 9 p.m. on the 27th; the mean was 30·294 in. The rainfall was still below the average, the total amount being 1·85 in. with 14 wet days. Fog occurred on 11 days.

MARCH.

" March winds, and April showers,
Bring forth May flowers."

The temperature during this month was somewhat variable. The weather was mild from the 1st to the 12th; cold from the 13th to the 17th; mild from the 18th to the 21st; and then cold, with snow, to the end of the month. The highest temperature 56°7 occurred on three days, viz., 2nd, 3rd and 7th, and the lowest 24°3 on the 23rd; the mean was 41°2.

Atmospheric pressure was still above the average, the mean being 30·131 in.; the highest was 30·692 in. at 9 p.m. on the 16th, and the lowest 29·235 in. at 9 a.m. on the 29th. Rain fell on 11 days, the total amount being 1·65 in. Fog occurred on 2 days, and snow fell on 6. A lunar halo was seen on the 13th.

APRIL.

"April weather,
Rain and sunshine, both together"

The cold weather which prevailed during the latter part of March continued till about the 11th, when a warmer period set in which lasted more or less throughout the remainder of the month. The maximum temperature was 65°0 on the 30th, the minimum 25°8 on the 1st, and the mean 47°2.

Atmospheric pressure was more than a quarter of an inch below that of the preceding month, the mean being 29·846 in. the highest 30·226 in. occurred at 9 a.m. on the 27th, and the lowest 29·218 in. at 9 a.m. on the 1st. The number of rainy days was 15, and the total fall 2·59 in. Snow fell on 2 days and hail on one. Fog occurred on 2 days.

MAY.

"A wet May
Will fill a byre full of hay."

The weather was mild till the 19th, but cold during the remainder of the month. The maximum temperature was 69°8 on the 10th, and the minimum 35°3 on the 31st, the mean was 53°5.

Atmospheric pressure was low during the month, the mean being 29·801 in. the highest 30·179 in. occurred at 9 a.m. on the 30th, and the lowest 29·312 in. at 9 a.m on the 24th. The total rainfall amounted to 4·26 in. and exceeded that of any previous May during the past 14 years. The number of rainy days was large, viz 22; thunderstorms occurred on 6 occasions and hail on one. Fog was observed on the 2nd and 9th, and solar halos on the 2nd and 27th.

JUNE.

June, if sunny,
Brings harvests early."

The weather was cold till the 18th, but warm from the 19th to the end of the month. The maximum temperature was 84°8 on the 26th, and the minimum 41°6 on the 15th; the mean was 59°6.

Atmospheric pressure was very uniform, the highest being 30·250 in. at 9 p.m. on the 6th, and the lowest 29·540 in. at 9 p.m. on the 11th; the mean was 29·953 in. Rain fell on 15 days to the amount of 3·98 in. Thunderstorms occurred on 5 days, hail on 1, and fog on 2. A lunar halo was seen on the 7th.

JULY.

"In July
Shear your rye."

The weather during the first few days was cold, but afterwards warm especially from the 17th to the 23rd. The maximum temperatures exceeded 80° on five occasions, the highest being 83°9 on the 19th; the minimum was 43°7 on the 4th, and the mean 61°9.

Atmospheric pressure was rather high and not subject to much variation; the highest 30·388 in. occurred at 9 p.m. on the 31st, and the lowest 29.695 in. at 9 p.m. on the 24th; the mean was 30·061 in. Rain fell on 8 days only, but amounted to 2·61, in. of which 1·16 in. fell on the 1st. Thunderstorms occurred on 4 days and fog on 2.

AUGUST.

"Midsummer rain
Spoils wine, stock and grain."

Owing to the cloudy state of the sky the temperature did not vary much, and the weather was consequently somewhat cool. The Maximum temperature was 74°6 on the 5th, the minimum 48°0 on the 1st, and the mean 61°3.

Atmospheric pressure was low and subject to more variation than in the preceding month; the highest 30·318 in. occurred at 9 a.m. on the 1st, and the lowest 29· 404 in. at 9 a.m. on the 16th; the mean was 29·770 in. The rainfall amounted to 5·52 in. and was in excess of that of any previous August during the past 14 years. The greatest falls were 1·44 in. on the 2nd, 0·95 in. on the 13th, and 0.73 in. on the 29th; the number of rainy days was 19. Thunderstorms occurred on 4 days and fog on one.

SEPTEMBER.

"September, blow soft,
Till the fruit's in the loft."

The weather during the first part of the month was mild, but cold during the remainder. The maximum temperature was 73°4 on the 11th, and the minimum 32°7 on the 24th; the mean was 55°9.

Atmospheric pressure was high during the first half of the month, but afterwards was low and unsteady; the highest 30·310 in. occurred at 9 p.m. on the 2nd, and the lowest 29·508 at 9 a.m. on the 23rd; the mean was 30.018. Rain fell on 13 days, the total amount being 1·76 in Thunder was heard on the 8th, and fog occurred on 6 occasions.

OCTOBER.

"If foxes bark in October, they are calling up a great fall of snow."

This month with the exception of the last few days was for the most part mild. The maximum temperature was 72°6 on the 5th, the minimum 30°9 on the 30th, and the mean 50°1.

Atmospheric pressure was low and subject to considerable variation; the highest 30·347 in. occurrred at 9 p.m. on the 12th, and the lowest 29·028 in. at 9 a.m. on the 26th; the mean was 29·793 in. The total rainfall amounted to 4·01 in. with 16 rainy days. Lightning was seen on the evening of the 22nd, and a lunar halo on the 11th. Fog occurred on 9 days.

NOVEMBER.

"At St. Martin's day
Winter is on his way."

The cold weather which set in at the end of October continued throughout this month accompanied with N and NW winds. The maximum temperature was 52°0 on the 25th, the minimum 25°0 on the 23rd and the mean 37°8.

Atmospheric pressure was unsteady; the highest was 30°510 in. at 9 p.m. on the 19th, the lowest 29 319 in. at 9 p.m. on the 24th, and the mean 29·802 in. Rain fell on 15 days, amounting to 3·63 in. Snow fell on 7 days, and fog occurred on 2.

DECEMBER.

"An early winter
A surly winter."

The weather till the 25th, was very cold especially from the 8th, to the 25th, but mild from the 26th, to the end of the month. The mean temperature was below 32° on 17 days, and the maximum on 5 days: the minimum fell below 20° on the 23rd, 24th and 25th, the lowest being 14°0 on Christmas day; the mean for the month was 32°1. The following figures give the minimum mean temperatures for each December since 1865.

	Min.	Mean.		Min.	Mean.		Min.	Mean.
1865.....	24·8	41·6	1870.....	9·0		1875.....	19·0	37·7
1866.....	23·1	42·6	1871.....	16·3	37·4	1876.....	28·6	42·9
1867.....	17·7	37·2	1872.....	23·4	41·6	1877.....	26·7	39·3
1868.....	31·7	45·3	1873.....	15·8	39 7	1878.....	14·0	32·1
1869.....	17·3	36·4	1874.....	8·8	31·7			

Atmospheric pressure was for the most part low, the mean being 29.755in, the highest 30.387in. occurred at 9 p.m. on the 24th, and the lowest 29·241 in. at 9 a.m. on the 19th. The general direction of the wind was from W to N. The rainfall amounted to 2·07, in. with 11 wet days. Snow fell on 7 days, and fog occurred on 10.

BOYS RE-WEIGHED IN 1876, AND AGAIN IN 1878.

No.	Name.	Age. Years.	Form	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
293	Andrews.....	16½	Up. Sh. b	5	5	6½	8	9	35½	22	1	32¾	4¾	9½	2¼	12	1
374	Arkle	17½	6th Form	5	8	1½	10	4¾	18¾	22	¾	33	2	10½	¾	13½	½
308	Armstrong	17½	Low. 5 1	5	8	4½	10	10	32½	22¾	¼	33	2½	10½	1	14	¾
25	Arrowsmith ...	16½	Mod. Up. 2	5	8½	5½	10	5	29	22½	½	32¾	3	9½	1	14	1½
580	Askwith	19½	6th Form	5	6¾	4¼	9	5½	26¾	23	½	32	2	9½	1	13½	1½
181	Baggallay	18½	Mod. Up. 1	6	0½	1½	12	3½	11½	22½	¾	37	2	12	1	13	0
43	Baskerville	17½	Up. 5	5	9½	2¼	10	11	12	22½	¼	34	2	10	0	13½	—½
415	Bellhouse	17	Mod. Up. 2	5	5½	7	8	12	33½	22	¼	30	2¼	9¾	1¼	13¼	1½
542	Bengough	17	Mod. Up. 2	5	9½	5	9	13¼	33¼	22½	½	32½	2¾	9¼	½	13½	1¼
190	Bird.....	17	Up. 5	5	5½	6	8	13½	30¼	21½	½	31	1¼	9	¼	12½	1¼
296	Birdwood	16½	Mod. Up. 1	5	5½	5	9	3	31½	21¼	1	31½	3¼	9¾	1¾	13	1
188	Bowden-Smith	17	Up. 5	5	7½	2¼	9	6½	8½	22½	¾	31	½	9½	¼	13½	½
47	Brodhurst	15½	Low. 5, 1.	4	10½	3½	7	4	18½	21	½	28½	½	8¾	1	12½	1¼
469	Brown	16	Mod. M. 1	5	0¾	5	7	1	21¼	21¾	¼	28½	1¼	8¼	1	12¾	1¼
470	Brown	14½	Mod. M. 1	5	1¼	4¾	7	1½	18¾	21½	¼	28	—½	8	¾	13	1¼
193	Bulley	17½	Mid. 5	5	10¼	5¾	10	2	27	22	0	31	½	10	1¾	13	1
449	Burnett	19¼	6th Form	6	1½	1¾	12	4	19¼	22¾	¼	35½	1½	10	—1	14¼	0
137	Busk	17¾	Up. 5	5	10	4¾	10	12½	32¾	22	1	33	2½	9¾	1	13½	¼
416	Butcher	18¼	Mod. Up. 1	5	11½	1	12	11¾	15¾	23¼	½	36	½	11¼	—½	14¾	½
285	Carter	16½	Mod. M. 1	5	9	1¼	11	7¾	20½	22	½	34¾	¾	11	0	14	¾
60	Chandler.....	20	6th Form	5	7	¾	9	13	¼	22¼	¼	31½	0	10¼	1	12¾	—¾

No.	Name.	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
140	Chappel	17¾	6th Form	5	10¾	3¾	10	1	21½	22	½	33	2½	8¾	0	13½	½
559	Charley	18	Up. 5	5	10½	1¾	11	4½	17	22¾	0	31	0	10½	¼	14	¼
29	Cholmeley	15	6th Form	5	1¾	6¼	7	10¼	29½	21	½	30½	3¾	8½	¾	12½	1½
20	Cholmondeley	18	6th Form	5	6¾	4¾	9	13½	24	22¼	½	33	2¼	10½	1	14	1
151	Clarke.....	16½	Mod. Up. 2	5	4¾	4¾	9	7	32	21½	¾	31½	1½	9½	¾	15	2
129	Coetlogon	17	Up. 4 a	5	7½	3¾	7	10½	13½	21½	0	30½	2½	8¼	¾	12	0
309	Coetlogon	15	Up. 4 a	5	4	3¾	6	13½	10½	21½	¼	29	¾	8	0	10½	—¼
368	Crowe.....	15	Mod. L. 1	5	6¼	5¼	9	2½	33¾	22	½	31	1½	9¼	1	12½	1½
569	Curtler	19	6th Form	6	1½	3	11	6½	23½	22	¼	32	0	10	1	14	½
226	Dalton	17¾	6th Form	5	6½	1½	9	11	15½	23	¼	30½	¾	10	¾	14	½
90	Daubeny	16½	Low. 5, 2	5	3¾	5¼	8	6	26¾	21	¼	32	2	8¾	0	12¾	1¼
13	Davies.....	17¾	6th Form	5	6½	3½	9	5½	21¼	23	½	31	2½	9½	¾	12¼	¼
30	Davies.....	15	6th Form	5	3¾	4¼	8	1½	24¾	22½	0	29¼	—¼	8½	½	12	1
139	Denman	18	Mod. Up. 1	5	7	1	10	0½	16¾	22½	½	23½	2¼	10	1	13	1
331	Dickinson	17	Mod. Up. 2	5	5½	6	8	0	20½	22	¼	29½	¼	8	0	11¾	¼
187	Dods	16½	Mod. Up. 2	5	7	6	9	10½	33	22¼	1	32	2½	10	1½	13¾	0
45	Du Boulay.....	18¾	6th Form	5	5¼	1½	8	11	15	21	¼	32½	1¾	9¾	¼	13	¼
59	Ellis.....	19¼	6th Form	5	6	¼	9	3	—½	22¼	¼	32½	0	9¼	¼	13½	¼
79	Elton	16¾	6th Form	6	10½	4½	10	2	25½	22½	½	32½	2	9½	1½	13¼	¾
17	Eyres	17¾	6th Form	5	7	4¾	8	9	25½	21¾	¼	32	3	9	½	13	1½
263	Farquharson ...	18	Up. 5	5	10¾	3¼	10	8½	19½	21½	0	34	2	9¾	¼	13¼	¾
273	Farrar.....	16¾	Up. 5	5	5½	4½	8	8½	29½	21	¼	31¾	2¼	9	1	13	1½
89	Firminger	17½	Low. 5, 1	5	9	2	11	5	25	23¼	¼	34½	2½	11	1	15	1

No.	Name.	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
360	Fountain	16	Low. 5, 1	5	7	6	9	2½	32	22½	0	29½	½	8½	½	13½	1½
191	Fowler	18½	6th Form	5	10½	1½	15	0½	37	22½	0	40	5	13	1½	16	1½
6	Furneaux	18½	6th Form	5	4½	4	9	11½	28½	23	¾	33	4	9½	1	14	1
100	Gennie	18½	Up. 5	5	8½	5½	9	11½	30½	22¾	¼	33¾	4¼	9¾	2	13	1½
233	Goddard	19	6th Form	5	7¾	2¾				22¾	¼	32½	½	10	¾	13½	½
189	Gordon	18	Mod. Up. 1	5	7	4	10	1¾	29¾	22	¼	35½	3½	10	1	14	2
102	Griffith	19½	6th Form	5	5½	¾	9	9½	19½	21¾	¼	33½	2½	10	½	13¾	1
361	Hamilton	17¾	Mid. 5	5	3¼	5¼	8	13½	31	21¼	¼	30½	1¾	9¾	¾	13½	¾
467	Hayes	17¼	6th Form	5	6¼	3¼	9	11¼	28¼	21½	¾	32	1½	9¾	¼	13½	½
494	Hayes	16½	Mod. M. 2	5	7½	4¼	10	4½	34½	22	1	33	3½	10	1	13½	¾
9	Hunt	17¾	Up. 5	5	6½	3¾	9	10	30¼	22	1	32	¾	10	0	14	1½
446	King-Salter ...	17	Mod. Up. 1	5	6¼	6	9	1¼	37½	21¾	¾	31	3	9	½	13	1½
450	Jacson	17¾	Mod. M. 2	5	5¼	6¼	9	7½	38½	22¼	¾	31¾	3	10¼	1¾	13¼	1¼
456	Kirkpatrick ...	16	Mid. 5	5	2¼	4¼	7	10	17¼	22½	0	30	1¼	8¾	¼	13½	1¼
142	Kite	17½	Up. 5	5	9	1	10	8	11½	22½	0	32¾	¼	9½	0	13	0
355	Lawford	17¼	Mod. Up. 1	5	6¼	4¾	8	10	27¾	21½	½	29½	1¼	9	1½	12½	¾
50	Lewis	17¾	Mod. Up. 2	5	2½	5½	8	0½	20¾	22	¼	29	0	8¾	¼	12½	½
566	Mercer	17½	Up. Sh. a	5	10¾	3	11	8¾	24	22½	¼	34	0	10	½	14	¼
414	Milner	19	6th Form	5	6	1¼	9	4	14½	22¼	¼	33	0	9½	1	14	1
186	Moore	16¼	Mid. 5	5	2½	4¾	8	3	15¼	23	¼	31	2	9½	¼	12¾	¼
433	Napier.....	19	6th Form	5	8	4½	10	6	27½	22	0	34½	2	10	¾	13½	¾
182	Oakley.....	17	Mod. M. 1	5	9	5	9	1¾	17¾	21	¼	31	2½	9¼	½	13¾	1
372	Olivier	19½	6th Form	5	6	1½	9	8½	15	22½	¼	32½	—1¼	8¾	½	13½	½

No.	Name.	Age. Years.	Form.	Height. ft.	in.	Inc. in.	Weight. st.	lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
365	Palmer	16¼	Mod. M. 2	5	5¼	5¼	8	12½	29½	21½	½	29½	2	9	1	12½	¼
56	Paul.....	17	Mod. L. 2	5	7¼	5¼	9	11	37¼	21½	½	34½	4	9½	1½	13½	1¼
383	Peacock	17	Low. 4	5	5½	2¼	9	6	23¼	22¼	½	32½	2	10	1½	13½	¼
394	Rayner	16½	Mid. 4 b	5	3½	5	8	3½	27	21¾	¾	30½	1½	8¾	¾	12	¼
5	Rogers..	19	6th Form	5	3	¼	9	5	5¼	22½	0	33½	—½	9¾	0	13	—½
132	Rogers.....	17½	Mid. 5	5	2½	4¼	8	12½	30½	21½	½	32	3	10¼	2	13½	1¼
575	Rooke	15¾	Up. Sh. b	5	9	7¼	8	11¼	33¾	21	½	29	1	9	1½	12½	1¼
423	Savile	18	Mod. Up. 1	5	9¼	4¼	9	11½	24	20½	0	31½	1½	9¼	½	13¼	¾
232	Scamell	16¼	Up. Sh. b	5	3¼	5½	8	7	27	21½	¼	31	1½	9¼	1¼	12¾	1¼
213	Silver	15¼	Mid 5	5	5¾	2½	8	5¼	19¼	23	½	29	½	8½	¾	12½	¾
158	Sutton.....	15	Low. 4	5	4¼	6	8	11½	25	22¼	½	31	1¼	9½	½	13	½
67	Tatham	15½	Up. Sh. b	5	6	5¾	10	2½	33	22¾	¼	32½	2	9¾	½	13	¾
367	Thomson.....	17½	6th Form	5	7¾	2¾	10	12½	21	22¼	¼	32¾	¾	10	1	14½	¼
2	Vassall	17½	6th Form	5	9¼	1	13	5¾	19½	23¼	0	35½	0	11	—¼	16½	1
37	Watson	19¼	6th Form	5	6½	¾	9	0	3¼	21½	0	32	½	9	—¼	12½	—1¼
114	White	15½	Up. 5	5	2½	5	8	0¾	31½	21½	¼	28½	¾	8¼	—½	12¾	0
428	Weston	17¼	Mid. 5	5	11¼	1¾	11	8¼	18½	23	¼	32	½	9¾	½	14½	½
87	Wilkinson	17½	Low. 5 1	5	4¼	2¼	8	7¼	12½	22	0	30¾	¾	9	0	12¾	½
509	Womersley	17¾	Mod Up. 2	5	5¾	2¾	10	7¾	20¾	22¾	¼	32½	1½	10¾	1½	15	¾
486	Worship	19¾	6th Form	5	8	1¼	10	4½	10¾	22	½	33	0	10	½	13¾	
462	Yetts	17	Mid. 4 a	5	9	2½	11	3	24¼	22	½	34	1½	10½	¾	15½	1¼

BOYS ADMITTED SEPT., 1874. RE-WEIGHED OCT., 1876, AND AGAIN NOV., 1878.

No.	Name.	Age. Years.	Form	Height. ft.	in.	Inc. in.	Weight. st.	lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
488	Bailey, E.B. ...	16¾	Mod. M. 1	5	5	4	8	12¼	19¾	22	¼	30½	2¼	9	½	13¼	1¼
14	Bryant, F.J. ...	16	Mid. 5	5	2½	4	8	1¾	24¼	21	¼	30¾	¾	8¾	¾	12	½
326	Calendar, H.L.	15½	6th Form	5	7	6	8	2	28	22	½	31½	3½	9¼	1½	12	¾
35	Cox, E.M.R. ...	16½	Mod. M. 1	5	8½	5½	10	2	31	21¾	0	30¾	¾	9½	½	13¾	1¾
7	Gilbanks, G.E.	18	Low. 5 1	5	9¼	3¾	10	7	19½	23	½	32	3½	9¾	¾	14¼	1
71	Glyn, A.P.	14¼	Up. 4 b	5	9	7¾	9	9	37	22	¼	29	1	8¾	1½	13½	1½
571	Hatch, A.V. ...	18	Up. 5	5	8½	1	10	1¼	15¾	22	½	32½	½	9¾	¾	12¼	—¼
23	Hawkins, G.G.	18	6th Form	5	9¾	3¾	11	1½	35¾	22½	¼	35½	4	10¼	1¼	13	½
455	Hordern, H.R.	15¾	Mod. L. 2	5	4½	5¾	8	5¼	27¾	21½	¼	27	0	8½	½	12¾	1¼
245	Kerry, A.P. ...	16¼	Low. 5 2	5	3	4½	8	2¼	24¼	21¼	½	30½	½	9¼	1¼	12½	1
429	Lawrie, H.L. ...	14½	Low. 4	5	1½	4¼	6	12¾	18	21½	½	27¾	1¼	8	¾	12	¾
253	Peake, A.	18½	6th Form	5	10¼	1½	11	7	11½	22¾	¼	34	½	11	¼	14¾	¾
482	Petrie, R.D. ...	17	6th Form	5	6	4¼	9	3¾	22¾	21½	½	30½	1¾	9¾	1¼	13¼	½
150	Rogers, M.	16	Low. 5 2	5	3¾	5¾	8	3	29½	22	¼	29½	2	9¼	1¼	12¾	1¼
275	Sanders, H.M.	17	Mod. M. 1	5	3¼	3¾	8	1	19¾	21¾	¼	29½	2	8¾	½	13	1
51	Turner, A.B. ...	16	Low. 5. 1	5	9½	2¾	11	7	28¼	22½	½	34	1½	10¼	½	14	¾

BOYS WEIGHED MARCH, 1876. RE-WEIGHED FEBRUARY, 1878.

No.	Name	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
268	Bagge, G.	14¼	Up. 4 b.	5	0¾	3¾	7	2½	21½	21½	¾	27½	1½	8	1	12	1
277	Bell, R. M.	14½	Mid. 4 a.	4	8½	2¾	5	9¾	10½	21½	½	26¾	0	7¾	½	11½	1
570	Bellhouse, V....	14¾	Mod. L. 1.	4	10¼	3	6	0½	26¼	21¼	¾	28	2½	7½	¼	10½	½
548	Bent, W. B. ...	14¾	Mod. L. 2.	5	2¾	6¼	7	12¾	29½	21¼	¾	29	2	8½	1	12½	1½
384	Bett, W. E.....	14¼	Mod. M. 2.	5	2¼	4	7	11½	18	21¼	¼	28½	½	8¾	¾	12¾	1½
419	Chase, R. G ...	16¼	Up. Sh. b.	5	4	4¾	9	9	32	22½	½	32½	2½	9½	1½	14	1
511	Colley, L. E. ...	14¼	Up. 3.	4	10¼	4	5	8	13½	21	0	26	1	7¼	¾	10½	1
279	Crookenden, H.M.	16	Mod. M. 1.	5	7	5	10	3½	34¼	22½	0	33½	3	10½	1¼	13¾	1½
588	Davis, W. L. ...	16¼	Up. 4 b.	5	7¼	5¾	9	6¾	33¼	21¼	¼	32½	2½	8¾	¾	13	1½
271	Dobie, D.....	16¼	Up. Sh. a	4	11½	3	6	7¼	12¾	21½	¼	28½	1½	8¼	¾	11½	1½
93	Ellis, W. W. ...	16	Low. 5, 2	5	9	5¾	10	1½	37¼	22¾	½	33¼	2¾	9	1½	14¼	1½
391	Ellison, G. F. ...	16¼	Mid. 5.	5	4½	5¾	9	0¼	32	22½	½	31¼	2¼	10	1	13¼	1¼
267	Gale, J. S.	14¾	Mid. 4 a.	5	0½	3¼	6	13¼	17½	20½	0	29	1½	7½	½	11¾	¾
297	Henniker, J. G.	16	Mid. 5.	5	10	4	11	2½	25¼	23	¼	33½	½	11	1¼	14½	¾
75	Highton, H. P.	12¼	Low. 4.	4	8½	3	5	12	12¼	21¼	¼	26	½	8	¾	10½	¼
209	Hill, R. E.	16¼	Up. Sh. a.	5	5½	5½	8	7	27½	22	¼	29½	2½	8¾	1	12¾	1¼
210	Hill, F. J.	15¼	Up. Sh. a.	5	3½	3¼	7	10½	12	22¼	¼	31¾	1¾	9¾	1¼	12	½
118	Hillman, A.E.E.	15½	Mod. Up. 2.	5	4½	5	8	1	27¼	21½	½	29	1½	8¾	1¼	12½	2
55	Hitchcock, R.A.	16	Low. 5, 2.	5	5¾	2½	9	9¼	20½	22½	½	31½	½	10¼	1¼	13½	1½
265	Laidlay, W. R.	15	Up. Sh. a.	5	3	5¼	7	4	21¼	22	½	29¼	1¼	8	1	11½	1
521	Leaf, H. M. ...	15¼	Up. Sh. a.	5	2½	4½	7	2	20¼	21½	¼	29¼	¾	8	0	11¼	1

No.	Name.	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
491	Little, C. H. ...	15½	Up. 4 a.	4	11½	3½	7	5½	17	22	½	30	1	8¾	¼	13	1½
62	Pulling, H. G....	15½	Up. 5.	5	3¾	5¾	8	3¾	22¾	22¼	½	30½	2½	8½	½	13	1
262	Rendel, A. B....	15½	Mod. M. 2.	5	4¼	4½	7	10	12¾	21¾	0	27	—¾	8¼	¼	12	¼
236	Smithe, B. G....	15	Mod. Low. 1.	4	11	5	7	1	20	21½	½	29¾	3¾	8¼	¾	12½	1½
499	Thompson, R.B.	16	Mid. 4 b.	5	4½	5¾	8	9½	23¾	22	½	32	2½	8¾	¼	12½	½
168	Thompson, F....	14¾	Up. 3.	4	11¼	2¾	6	9½	15¾	20¾	¼	27½	¾	8	¼	11¾	1½
202	Thring, L. C. R.	15¼	Up. Sh. b.	4	11½	3½	6	10¾	9	21¾	¾	28¾	1¾	8½	¼	12	1
540	Tracy, W. M. ...	15¾	Low. 5, 2.	5	5	6	8	13¾	34¼	21½	1	30½	3	9	1	13¼	¾
413	Trotter, J. C. ...	14¾	Mid. 4 b.	4	10¾	3½	7	3½	12¼	22¼	0	31	2¼	8¼	½	12¾	1
541	Turner, F. S....	14¼	Mod. Low. 2.	5	2½	5¼	8	6	24	22¼	½	29½	1¾	9	½	13	1½
170	Valintine, T.H.A.	12¼	Low. Sh.	4	5¾	2	6	1¾	15¼	21	0	27½	1½	8	¾	12	1
468	Vian, W. C. ...	16¼	Mod. Up. 2.	5	4½	2¼	10	6¾	25	23¼	½	32	1¾	11½	1¾	14	¾
539	Vickers, E.	14½	Mod. Low. 1.	5	5	6	9	0¾	33	22	1¼	30½	3½	9¾	1½	13½	2
15	Wade, E. R. ...	16	Mid. 5.	5	5½	5	8	12¾	30¾	21¼	¼	30	1½	8¾	¾	12	½
165	Whitaker, R. H.	16¼	Mid. 4 a.	5	2¾	5¼	8	2	25½	21½	0	31½	3	9	1	12	¾
366	Windeler, F. B.	14¾	Mod. M. 1.	4	11¾	4¾	6	10½	15	22	½	27	¼	8¼	½	12	1

BOYS ADMITTED MAY, 1876. RE-WEIGHED MAY, 1878.

264	Callendar, W. J.	13½	Up. 4 a.	4	10¼	3¼	6	7¼	13	22	¼	28½	1½	8½	½	11¼	¼
216	Cortes, W. H....	13	Low. Sh.	4	7½	3½	5	13¼	—½	21	0	26½	1¾	7¾	¾	10½	0
31	Davies, M. L. ...	13½	Low. 5, 1.	4	10½	2¾	6	9½	12¼	21½	0	28	1	8½	½	10½	¼
289	D'Urban, W.H.M.	13½	Mod. Mid. 1.	4	9	3	5	10	13	21½	¼	26¾	1¾	6¾	½	10¾	—¼

No.	Name	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
119	Dyson, S.P.H.	15¾	Mid. 5.	5	2	4¾	8	5½	24½	21	½	30½	1¾	9¾	¾	13	1
546	Ewart, J. S. ...	17	Mid. 5.	5	7½	4½	11	10	54½	22	½	33	2½	9¾	1½	12¾	1
208	Feetham, E. ...	14¾	Low. 4.	5	2	4	6	8½	18	21½	¼	26½	1½	7¾	¼	11½	¾
300	Fisher, J.	16	Mod. Mid. 1.	5	6¾	5¼	9	2	31½	22	½	32½	2¾	8½	½	12½	1
443	Fletcher, E. ...	15¼	Low. 5, 2.	5	0¼	2¾	6	11¼	17¼	22	¼	27½	2½	8	½	11½	¼
177	Hardy, R.	13	Low. 3.	4	9	2½	7	1¼	12½	21½	—½	28½	0	8¼	0	12½	¼
61	Hartley, J. B.	16¾	Low. 5. 1.	5	7½	2¾	10	4¼	23¾	21½	½	32	3	10	¾	14½	1
219	Hookin, J. M....	13¾	Low. 3.	4	10½	2½	6	3¼	10	21½	0	25½	0	7½	½	11	¼
335	Impey, L.	15¾	Mod. Mid. 1.	5	6¾	5½	9	4½	36	22	½	32½	5	9¼	½	12½	1
515	Priestley, J. C.	16¼	Up. 4 a.	5	5½	5¼	8	7	27	22	1	30½	1½	9¼	1¾	13	1½
261	Ravenhill, H. T.	15¼	Mod. Up. 2.	5	6¼	4½	9	2½	32½	22	½	31½	3	9½	1¼	12¼	½
510	Rolleston, H. D.	15¾	Up. 4 a.	5	4	3¼	7	8¾	16	21¾	¼	27½	—½	7¾	¼	12	0
381	Sinclair, J. L....	13	Low. Sh.	4	9¾	3¼	6	13½	16¾	21	0	27	2	8½	¼	12	½
169	Street, F.	13¾	Low. 4.	5	1¼	3½	6	10¾	11¾	22	¼	27	—1	8	¼	11	—½
440	Wynyard, W.B.A.	14½	Mid. 4 a.	5	4¾	6¼	9	3¼	40¼	22½	½	31½	5	9	1¼	13½	2¼

BOYS ADMITTED SEPTEMBER, 1876. RE-WEIGHED NOVEMBER, 1878.

No.	Name.	Age. Years.	Form	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
223	Aldworth, A. E.	14½	Mid. 4, b.	4	8½	2½	5	6	8½	20½	¼	25½	¼	7	¼	10	¼
298	Alston, G. C. ...	16½	Up. Sh. a.	5	5	5½	9	7	36½	22	¼	31½	3	9½	1½	13	1
33	Alston, F. S. ...	14½	Up. Sh. b.	5	4	5½	7	9½	20½	21	0	28½	1	8½	1	12	1
86	Atkins, P. C. ...	15	Up. 4, a.	4	9½	2½	6	1	9	21½	0	26½	¼	8	½	11	0
567	Beale, S. M. ...	16½	Up. Sh., b.	5	3	4½	8	8½	26½	21½	¼	30½	2	9½	1	13	1
465	Caldecott, P. ...	16	Mid. 4, a.	5	1	2½	6	12½	10	22½	¼	26½	0	7½	0	12	1
247	Casson, F. G. ...	14½	Up. 4, a.	5	2½	3½	6	9	12½	21	0	27	0	7½	¼	10½	¼
104	Chichester, A.G.V.	13½	Up. 3	4	11½	3½	6	11	12½	21½	¼	27	1	8½	¼	11½	¼
349	Christopherson, C.	15½	Mod. Mid. 1	4	11½	3	6	9½	13½	21½	¼	28½	2½	7½	¼	12	1
534	Cooke, T. W. ...	14	Mod. Low. 1	5	6	5½	8	8½	24½	21½	¼	29½	1½	8½	¼	12½	½
120	Craufurd, T.A.H.	16½	Mod. Up. 1	5	7½	4½	10	1½	25½	22	¼	32	3½	9½	½	13½	½
451	Curtler, W.H.R.	16½	Mid. 5	5	10½	2½	10	8½	18½	22½	¼	32	1	9½	¼	13½	½
69	Edgell, W. S. ...	16½	Low. 5	5	4½	4½	7	5½	18	22½	½	27½	1½	8	½	11½	1½
141	Eliot, P. H.....	15½	Low. 5, 2	5	4	4	7	10	14½	21½	¼	28	1	8	0	12½	½
402	Ellison, D.	15½	Low. 5, 2	5	1½	3½	7	7½	18½	22½	¼	28	1½	8½	½	12½	½
484	Fairrie, J.	16½	Mid 5	5	4	6	8	6½	28½	22	¼	30	1½	9½	½	12½	½
11	Gardiner, E. N.	14½	Mid. 5	4	9	2½	6	7	11½	21½	¼	29½	2	8	¼	13	½
3	Hawkins, A. H.	15½	6th Form.	5	6	6½	9	3½	33½	22	½	32	4	9	½	13	1
330	Hoffmann, C A.	14½	Mod. L. 1	5	7	5½	9	11½	36½	22½	½	31	2½	9½	1	13½	1½
126	Hooper, C. H.	12	Mod. L. 2	5	1½	3	6	10	7½	21½	¼	28	2½	8½	0	11½	½
305	Martineau, H.	14	Mod. L. 1	4	11	2½	6	0	12	21	¼	27	1½	7½	½	10½	¼

No.	Name.	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
306	Martineau, S....	12½	Mod. L. 1	5	0½	4	6	12½	15½	21	½	27½	1	8½	1	11½	¼
70	Mason, T. E. ...	13¾	Low. 4	4	11½	3½	6	10½	10½	21¼	¼	27½	½	8	¼	11½	0
116	Mocatta, E. H.	13½	Low. 3	4	6½	¾	5	11	14¼	20¾	½	26	1	8	1	11	1
532	Padwick, H. C.	15½	Up. 4, a.	5	3	3	8	0	11	22½	¼	30½	2½	8¾	¼	12½	¼
311	Page, F. E. J.	15½	Up. Sh., a.	5	3½	3¾	8	2	23¼	21	¼	29½	2¾	9	¾	12¾	1¼
496	Pearse, S. A. ...	15¾	Mod. Up., 2	5	3	3¾	7	6¼	17¼	21½	0	27	1¼	7½	½	12¼	¾
82	Pine Coffin, C.E.	15¾	Mid. 4, a.	5	2	4	7	8	30	21½	0	28	0	8	½	11¾	¾
179	Rich, A. L.....	15¼	Mod. L., 2	5	2½	4	7	2¼	14	22	¼	28½	1¼	7¾	½	12	¾
314	Scott, H. R. ...	16¼	Mod. Mid., 1	5	7	6	10	0¼	38	22	½	32¾	3¾	9¾	1	13¼	1¼
535	Showell, W. ...	16¾	Mod. Up., 1	5	8	6	9	13¼	32	22	¼	31¾	4	9¼	¾	13¼	1¼
514	Simeon, P. B....	16	Mid. 4, a.	5	4½	6¼	8	4½	31	21½	½	28½	2	8	½	14¼	1¾
66	Thomas, P. C.	16½	Up. Sh., b.	5	9¾	6¼	10	8½	36½	22½	¾	30½	1½	10	1½	14	1
97	Vincent, E. C.	14½	Up. Sh , b.	4	8½	2½	5	10¾	11½	20	0	25½	0	7¾	½	11¼	1¼
121	Wauchope, D. M.	14½	Up. Sh., a.	5	3½	5½	8	0	24¼	21¾	½	28½	3	8¾	1	12½	1½
411	White, E. D. ...	13¾	Mod. L. 2	4	8¾	7¼	5	10½	19¼	21¾	¾	25½	½	8	½	11¼	1
436	Wright, H.	17¼	Mod. Up. 1	6	1	3	11	10½	18½	22½	¾	33¼	2	10½	¾	14½	½
183	Wynne, O.	14¼	Mid. 4 b.	4	10¾	1½	6	11½	32¾	21¾	1¼	28½	3½	8	¼	11½	½

BOYS ADMITTED JANUARY, 1878.

No.	*Name.*	*Form.*	*House.*	*Born & Age.*	*Height.* ft.	in.	*Weight.* st.	lbs.	*head.* in.	*Circumference of* chest. in.	arm. in.	leg. in.	*Place of Birth.*
545	Baillie, A. V.	Low. 4	F.E.T.	Aug. 64—13¼	5	0½	7	2½	22	28½	8	12	London.
560	Bent, E. H.	2nd Form	W.E.M.	Feb. 66—11¾	4	7½	5	3	20½	26½	7	10½	London.
533	Bentinck, W. G.	Low. 4	W.E.M.	Nov. 64—13	5	1	7	1½	21½	28	7¾	12	Edinburgh.
553	Buckland, E.H.	Up. 4, a	F.E.T.	June 64—13½	4	11	6	3½	21	28¾	7½	11½	Middlesex.
382	Berkeley, G. A. H. C.	2nd Form	T.A.P.	Oct. 65—12¼	4	7½	5	0	19½	25¼	6½	10½	London.
117	Blackburne, E. R. I.	Up. 3	H.R.	Ap. 64—13¾	4	7¾	6	1¾	20½	28½	8	12	Chester.
310	Blandford, W. F. H.	Up. 4, b	H.B.H.	Dec. 64—13	5	2	7	11	21½	28½	8¼	13½	London.
378	Campbell, G. P.	Up. 3	W.M.	Sep. 65—12¼	4	6½	4	6¼	22	26¼	7½	11½	Liverpool.
81	Chambers, E. K.	Mid. 4, b	H.R.	Mar. 66—11¾	4	10½	6	2½	20½	27	7¾	11¾	Berks.
425	Clarkson, R. C.	Low. 4	A.H.B.	Feb. 65—12¾	4	5¾	4	12¾	20½	26	7	10	Middlesex.
435	DeChair, F. B. C.	Mid. 4, a	W.F.	Mar. 65—12¾	5	0½	7	5	21	29	8½	12	Norfolk.
77	Dickinson, P. F.	Mod. L. 2	H.B.H.	Aug. 63—14¼	5	8	8	9½	21½	29	8¼	12½	Somersetshire.
398	Duncan, S.	Up. 3	T.A.P.	May 65—12½	4	9¼	5	12	21	26½	7½	10¾	London.
344	Elam, E. S.	Low. 4	W.F.	Mar. 66—11¾	4	7½	5	6	21¼	25½	7½	11	London.
175	Everett, E. H.	Low. 4	C.S.	July 64—13½	5	0	7	2½	20¾	28¾	8	11½	South Devon.
576	Fasken, W. H.	Up. Sh. a	J.B.G.	May 63—14½	5	7½	8	9½	21½	30	8¾	12½	Madras.
481	Fox, W. H.	Up. 4, a	J.B.G.	Aug. 63—14¼	5	4½	7	0	21¼	29	8	11¾	London.
272	Gabbett, E.	Low. 3	H.R.	Feb. 65—12¾	4	5¾	5	4	21	2[illegible]	7½	10¾	Armagh.
558	Gurnett, G. R.	Mod. L. 2	F.E.T.	June 65—12½	4	10½	6	2½	21	27½	7¼	11	Demerara.
56	Harvey, R. C. M.	Low. 5, 2	G.S.	Sep. 64—13¼	5	1¼	7	7¼	22¼	27½	8½	12¾	Middlese
57	Harvey, J. M.	Mid. 4, a	H.R.	Dec. 65—12	4	5½	5	5¼	21	27	7¼	11	Middlesex.
251	Hartley, H. A.	Low. 4	H.R.	Mar. 63—14¾	5	2	7	9	20½	2[illegible]½	8¼	12¾	Suffolk. MeasuredMa
269	Hay, C. G.	2nd Form	H.R.	Oct. 65—12¼	4	9	5	8½	21	27	7¼	10	Durham. [24,1878

No.	Name.	Form.	House.	Born & Age.	Height. ft. in.	Weight. st. lbs.	head. in.	Circumference of chest. in.	arm. in.	leg. in.	Place of Birth.
393	Hemsley, W. J.	Up. 4, b	T.A.P.	Oct. 64—13¼	5 0½	6 13	21½	29½	7¾	11½	Ely.
347	Hockin, H. V.	Low. 4	H.R.	Feb. 64—13¾	5 0½	6 4½	20¾	27½	7½	10½	Kent.
16	Hunt, A. W.	Low. 5, 2	W.J.V.B.	Oct. 63—14¼	5 0½	6 11	22	27¾	8¼	12	Evesham.
290	Jones, R. D.	Up. 4, a	G.S.	Jan. 64—14	5 3¼	7 2½	21	28¾	7¾	11	Gloucestershire.
234	Jones, R W. H.	Up. 3	H.R.	June 64—13½	4 11½	6 11½	21	27	8½	11½	Demerara.
579	Knight, H. E.	2nd Form	W.E.M.	Jan. 66—12	4 11¼	7 0	21¾	27½	7¾	12	Middlesex.
287	Leaf, C. H.	Mid. 4, a	T.A.P.	Oct. 62—15¼	4 6	5 3	21½	28¼	7½	10½	
448	Marriott, W. S.	Low. 3	W.F.	Aug. 65—12¼	4 8¼	5 8¾	21	26	7½	11½	Dorsetshire.
192	Mullens, G. R.	Up. 4, a	H.R.	Ap. 64—13½	4 11¼	6 11	22¼	27½	8½	11½	Somerset.
568	Platt, A. H.	Low. 4	J.B.G.	July 63—14¼	5 5	8 0	20¾	29½	8½	13	Hants.
478	Petrie, W. J.	Mod. Low. 2.	J.B.G.	July 64—13¼	4 9¾	5 7½	20½	25½	7	10¼	Callao.
46	Rowe, F. E.	Low. 5, 2.	L.E.U.	Nov. 64—13	5 3½	8 7½	22	30	9	12½	Essex.
526	Smith, H. E.	Low. Sh.	W.E.M.	Dec. 65—12	4 7¼	5 11½	22	27½	7¼	10¾	Liverpool.
353	Taylor, N. C.	Mod. Low. 2.	L E.U.	Mar. 64—13¾	5 2	7 3¾	21½	30	8¼	11½	India.
507	Van, H. J. F.	Mid. 4 b.	W.E.M.	May 64—13½	5 3	7 12½	21¾	31	8½	12¾	Wilts.
517	Vaughan-Johnson, H.	Mid. 4 b.	W.E.M.	May 65—12½	5 0¼	7 0	21½	27	8	12	London.
134	Watson, A. H.	Up. 4 b.	L.E.U.	May 64—13½	5 0½	6 11	21	26¾	8	12	Cumberland.
464	Williams, S. G.	Low. 4.	W.F.	July 64—13½	4 11	6 10½	21¼	29½	8¾	12½	Exeter.

BOYS ADMITTED MAY 12TH, 1878.

128	Adams, E. P.	Low. Sh.	H.R.	June 65—12¾	4 9½	5 10¾	21½	27½	7½	10	Suffolk.
359	Beale, E. L.	Low. 4	Home-B.	Sep. 63—14½	5 2¾	7 2¾	20½	27½	8	11½	Aden.
65	Beatson, D. J. M.	Mid. 4 b.	C.S.	Aug. 64—13½	5 0¾	6 8½	21½	27	7¾	11	Surrey.
529	Bengough, C. F.	Mid. 4 b.	W.E.M.	Mar. 64—14	4 10½	6 2½	21¾	27	7¾	10¾	Gloucestershire.

No.	Name.	Form.	House.	Born & Age.	Height. ft. in.	Weight. st. lbs.	head. in.	Circumference of chest. in	arm. in.	leg. in.	Place of Birth.
357	Boulton, R. H. W.	Mod. Low. 1.	W.M.	April 63—15	5 1	8 5½	21½	29½	9½	13	Warwickshire.
238	Chittenden, G. S.	Up. Sh. b.	C.S.	Mar. 64—14	4 11	7 3½	22	28	8½	13	Oxfordshire.
137	Cholmeley, H. W.	2nd Form.	H.R.	Mar. 67—11	4 4	4 4	20½	21½	6½	10	Norfolk.
201	Creeke, H. B.	Mid. 4 a.	H.R.	Dec. 64—13½	4 9½	5 11	21½	27	7½	10½	Yorkshire.
566	Debenham, G. D.	Up. 3.	F.E.T.	Aug. 65—12½	5 1½	6 7½	20½	26½	6½	11	London.
282	Dobie, L. T.	Up. 4 a.	L.E.U.	Jan. 64—14¼	5 0	6 2	21½	26½	7½	11	Chester.
528	Elin, G. H.	Up. 3.	W.E.M.	Sep. 64—13½	4 8½	6 2½	21	28	8	11½	Hertfordshire.
380	Freeman, H. R.	Mid. 4 b.	W.M.	Mar. 64—14	4 9½	6 2½	21½	27½	8	11	Suffolk.
333	Heaton, K.	Up. 3.	H.R.	Aug. 64—13½	5 1½	7 6½	22	28½	8½	12	Denbighshire.
144	Hedley, W. C.	Up. 3.	H.R.	Dec. 65—12½	4 11½	6 8½	21½	26½	8	11½	Somersetshire.
188	Highton, G. A.	Low. 4.	H.R.	Sep. 63—14½	5 2½	7 9½	21½	28½	8½	11½	Somersetshire.
181	Hovell, R. D. B.	Up. 3.	H.R.	Dec. 64—13¼	4 10½	6 0½	21	27½	7½	11	Middlesex.
221	Hovell, D. D. B.	2nd Form.	H.R.	Jan. 66—12½	4 6½	5 6½	21	26	7	10½	Middlesex.
317	Leach, N.	Low. Sh.	H.R.	Mar. 67—11	4 5½	4 11½	21½	26	6½	10½	Lancashire.
133	Mangin, R. R.	Up. 4 b.	C.S.	Oct. 63—14½	5 0½	7 3½	20½	29	8½	12	Northumberland.
519	Nicol, W. J. W.	Low. 4.	W.E.M.	Feb. 64—14	4 6½	5 9	20½	27	7½	11	Scinde.
343	Ouvry, E. C.	2nd Form.	H.R.	July 66—11½	4 5½	5 1½	20½	26½	7½	10	Bucks.
491	Palgrave, A. G.	Low. 3.	F.E.T.	June 65—12½	4 8½	5 11½	21½	26	7	11½	Surrey.
9	Sandeman, V. S.	2nd F.	T.A.P.	May 66—12	4 8	5 12½	21½	26½	7½	11	Oporto.
50	Stirling, C. G.	2nd F.	H.R.	Jan. 66—12½	4 10½	6 3	21	26½	7½	11	Surrey.
182	Stokoe, E. R.	Low. 4.	H.B.H.	July 63—14½	5 2½	7 12½	21½	29½	8	13	Somersetshire.
60	Streatfield, H. C.	Up. 3.	H.R.	Oct. 66—11½	4 9½	5 7½	21	27½	7½	10½	Northumberland.
410	Tyrwhitt, L. F.	Low. 4	J.B.G.	Oct. 63—14½	5 6	9 5	22	31	8½	13½	Suffolk.
400	Tucker, J. C.	Low. 4	C.S.	Mar. 64—14	4 11½	6 1½	20½	28	7	11½	Dublin.

No.	Name.	Form.	House.	Born & Age.	Height. ft. in.	Weight. st. lbs.	Circumference of head. in.	chest. in.	arm. in.	leg. in.	Place of Birth.
25	Vaughan, H. R.	Up. 3	H.R.	May 64—13¾	4 8½	6 3½	20½	27	7¾	11¼	Cardiganshire.
375	Wilson, S B.	Mid. 4, a	T.A.P.	May 64—13¾	4 10½	5 10¾	21¼	26	7¼	10½	Surrey.

BOYS ENTERED SEPTEMBER, 1878.

346	Adamson, J. W.	Mid. 4, a	W.M.	Oct 64—13¾	4 10¾	6 10	20¾	26¼	7¾	11¼	Kent.
372	Alston, R. D.	Low. 4	W.M.	Sep. 64—14	5 0¾	7 2½	21	29½	8	12¼	Surrey.
73	Annesley, R. C.	Mid. 4, b	H.B.H.	Ap. 65—13¼	4 9½	6 1½	21	26½	8	11½	Cambridgeshire.
439	Atkinson, W. H.	Up. 4, b	W.F.	May 64—14¼	5 7¼	8 13½	22¾	31	8½	12½	Cumberland.
45	Bailey, H. J.	Low. 3	H.R.	Dec. 65—12¾	4 10	7 0½	21¼	27½	8	12¾	Palestine.
419	Barrett, H. W. L.	Mod. M. 1	H.B H.	Mar. 64—14½	5 5½	8 2	20¼	28¾	8¾	12½	Norfolk.
550	Bigge, D. L. S.	Low. 4	F.E.T.	Sep. 64—14	4 9	5 9½	20¼	24¾	7¼	10¾	Shropshire.
327	Bligh, F.	Low. Sh.	W.F.	June 66—12¼	4 7¼	5 11¼	20½	26½	7½	10¾	Victoria.
240	Bliss, C. E.	Low. Sh.	H.R.	Dec. 66—11½	4 9¾	5 9½	22	27½	7	10¼	India.
358	Boger, D. C.	Low. 4	T.A.P.	Oct. 65—12¾	4 10	6 0½	22	26	7½	11	Kent.
37	Bradley, H. V.	Up. Sh. b	L.E.U.	Mar 65—13¼	4 10½	6 4½	21½	27½	7	11	Wilts.
508	Burbury, F. W.	Mid. 4, a	W.E.M.	Nov. 64—13¾	4 10½	6 9	21½	27½	8½	11	Middlesex.
569	Carey, H. M.	Mod. L. 1	F.E.T.	Dec. 63—14¾	5 4¾	8 9	21½	30	8¼	13	Hants.
6	Challen, J. B.	Low. 5, 2	C.S.	Mar. 63—15¼	5 4	9 8½	23¾	31	9½	13¾	North Wales.
139	Chappel, H. R.	Low. 3	H.R.	Ap. 67—11¼	4 9½	6 4	22	26½	7½	12	Cornwall.
132	Coates, H. W. U.	Low. 4	H.R.	Dec. 65—13¾	4 11	6 6	21½	27	7	11½	Gloucestershire.
449	Cooper, T.	Up. 4, b	W.M.	July 63—15	5 9¾	9 4¾	22	32	8½	12½	Westmoreland.
499	Crommelin, A. C.	Up. Sh.	F.E.T.	Feb. 65—13½	4 9	5 11¼	20½	26¼	7¾	10½	Antrim.
559	Cunliffe, C. A.	Mid. 4, b	F.E.T.	May 65—13¼	5 8¼	10 6¾	22¾	31½	9¾	14½	Essex.
498	Dawson, A. E.	Up. 4, b	F.E.T.	Jan. 64—14½	5 2½	8 0	22	28½	8¾	12½	London.

No.	Name.	Form.	House.	Born & Age.	Height. ft. in.	Weight. st. lbs.	Circumference of head. in.	chest. in.	arm. in.	leg. in.	Place of Birth.
386	Dobson, F. T. S.	Low. 4	J B.G.	May 64—14½	5 4½	8 7½	21½	28½	9	12½	Australia.
319	Dowding, H. A.	Low. 4	H.B.H.	July 65—13	4 9½	6 1½	21½	26½	7½	11½	Wilts.
281	Earle, L.	Low. 3	H.R.	Jan. 66—12½	4 10	6 5½	21	27½	7½	11½	London.
414	Fawcus, R. F.	2nd Form	W.M.	Mar. 66—12½	4 9½	6 7½	21½	27½	8	11½	Durham.
233	Feetham, C.	Low. 3	H.R.	Oct. 65—12½	5 1½	6 9½	21	27½	8	11½	Monmouthshire.
474	Ferguson-Davie, H.A.	Mid. 4, a	F.E.T.	Aug. 65—13	4 11½	6 10½	21½	27	7½	11½	Bristol.
123	Footman, J.	Low. Sh.	H.R.	Nov. 65—12½	5 0½	6 1½	21	26½	7½	11	Suffolk.
191	Fowler, E. S.	Up. Sh. a	H.R.	May 64—14½	5 3½	6 7	21	25	7½	11	Kent.
167	Hadow, G. G. L.	Up. 4, b	C.S.	Aug. 65—13	5 1½	6 10	20½	27	7½	11½	N.W. India
244	Halcomb, S. B.	Mod. Mid. 2	W.JV.B.	Mar. 64—14½	4 10	6 0½	20	26½	8	11½	Staffordshire.
18	Horsburgh, C. W.	Low. 5, 2	G.S.	Aug. 64—14	5 3½	7 6½	21	27½	8	11½	Derbyshire.
500	Hort, A. F.	Mid. 5	W.E.M.	Jan. 64—14½	5 4½	8 5½	22½	29½	9	12	Gloucestershire.
87	Huleatt, A. J.	2nd Form	H.R.	Sep. 66—12	4 4	4 11½	21½	25	7½	10½	Middlesex.
531	Hutton, L. J.	Up. 3	W.E.M.	Aug. 65—13	5 0½	6 11½	22½	27	8½	11½	Surrey
308	Juckes, F. A.	Mid. 4, a	H.R.	July 65—13	5 5½	8 13½	22½	31	9½	13½	Shropshire.
538	Kingsbury, W. B.	Up. 4, b	W.E.M.	May 64—14½	5 3	8 6½	22	29½	9	13	London.
433	Lascelles, C. H.	Up. 3	W.F.	Jan. 65—13½	5 1½	6 4	20½	26½	7½	11	Yorkshire.
299	Longton, T. E.	Mod. L. 2	H.R.	Oct. 64—13½	4 7½	5 12	20½	25½	7½	10½	Lancashire.
462	Lyon, G.	Low. 5, 2	J.B.G.	Nov. 62—15½	5 7½	7 8½	22½	31	9½	13	Bristol.
59	Martin, D. E.	Up. 3	H.R.	Aug. 66—12	4 7½	6 3½	21½	28½	8½	11½	Kent.
324	Merewether, J. W. B.	Low. 3	H.R.	June 67—11	4 8½	6 0	22	26½	7½	11	India.
368	Mounsey, D. J.	Mid. 4, b	W.M.	April 65—13½	5 0	7 1½	21	28	8	12	London.
374	Nelson, E.	Low. 4	W.M.	Aug. 65—13	4 11½	6 8½	21½	27	8	12	Lincolnshire.
21	Orlebar, E. H.	Low. 5, 2	J.P.W.	Aug. 63—15	5 4½	8 7½	21½	31½	9	13	Bedfordshire.

No.	Name.	Form.	House.	Born & Age.	Height. ft. in.	Weight. st. lbs.	head. in.	Circumference of chest in.	arm. in.	leg. in.	Place of Birth.
200	Orr, H. H.	Mid. 4, a	H.B.H.	Dec. 64—13¾	4 10½	8 6	21	28½	8½	12	Oxfordshir?
467	Padwick, F. G.	Up. 4, a	J.B.G.	Aug. 65—13	5 2½	6 11¼	22	28½	9¼	13½	Sussex.
263	Peake, A.	2nd Form	H.R.	Jan. 67—11½	4 9	6 0	21¼	27¼	7¾	10½	Gloucestershire.
509	Porter, H. C.	Up. 3	W.E.M.	June 65—13	4 9½	6 6	21¼	26	8	11¾	Devonshire.
171	Price, E. W. B.	Mod. L. 2	W.F.	Dec. 64—13½	4 10¾	6 2¾	22	26¼	7½	11	Co. Down.
293	Prichard, M. S.	Mid. 4, b	H.B.H.	Jan. 65—13½	4 11¾	6 2	20½	26¼	7½	11¾	Somersetshire.
43	Pryce, H. G.	Low. 4	H.B.H.	Aug. 64—14	4 9½	6 6¾	23¼	28½	8	10¾	Carnarvonshire.
394	Quinton, F. W. D.	Mid. 4, b	W.M.	Dec. 65—12½	5 0½	7 5¼	22¼	28½	8¼	12½	India.
445	Randolph, G. B.	Mod. L. 2	W.F.	Oct. 64—13¾	4 10	6 3½	21	26¾	7½	11	London.
243	Rendle, A. C.	Low. Sh.	H.R.	July 66—12	4 6½	5 12¾	21¼	27	8¼	11	Suffolk.
225	Rigden, W. A.	Up. 3	H.R.	Oct. 64—13¾	4 5¼	5 1¾	22	24¾	7	9¾	Wilts.
450	Rogers, G. P.	Low. 4	C.S.	May 65—13¼	5 1½	7 0	21¼	28½	8	12	Cheshire.
286	Rowe, E. F.	Low. 3	H.R.	Jan. 66—12½	5 0¼	7 10¾	22	28	8½	11¾	Essex.
495	Scovell, C. T. R.	Mod. Mid. 2	F.E.T.	June 6¼—14¼	5 4¼	9 5	21¼	31½	9½	12¾	Dublin.
418	Senior, R. W.	Up. 3	A.H.B.	March 65—13½	4 10½	6 0½	20½	25¾	7¼	11	Kent.
285	Sharp, W. H.	Low. 5, 2	C.S.	June 65—13¼	4 8¾	5 4½	21	24¾	7	10¾	India.
189	Smith, C. G.	Mod. L. 2	C.S.	Mar. 65—13½	4 7	5 5½	21½	25	7½	10¾	London.
365	Stewart, W. B. O.	Low. Sh.	T.A.P.	Dec. 65—12¾	5 2	7 6	22	30¼	8	11½	Jamaica.
108	Stotherd, L. H. K.	Up. 3	H.R.	Oct. 65—12¾	4 8¾	6 4½	21½	26¼	7¾	11½	Gloucestershire.
165	Sutton, W.	Low. 4	G.S.	Dec. 63—14¾	5 4½	9 1¼	21½	30½	9¼	13½	Sussex.
301	Tufnell, L. C. G.	2nd Form	H.R.	Sep. 65—12¾	4 10¼	6 4	21½	26½	7½	11½	Essex.
39	Warren, H. R.	Low. 3	H.R.	April 66—12¼	4 7½	5 13	21¼	27¼	7½	11½	Somersetshire.
468	White, B. F.	Up. 4, b	J.B.G.	April 64—14½	4 9½	6 0	21¼	26½	7	11½	Surrey.
149	Woolner, H.	Up. 3	H.R.	Sep. 66—11¾	5 0¾	7 4	22¼	28½	8	12¼	London.

ACCOUNTS.

RECEIPTS.	£	s.	d.
Balance	28	5	6
Antiquities	11	16	0
Botanical Garden (valuation)	7	2	6
Field Days	10	2	0
Reports	69	11	6
Subscriptions—			
Members	7	17	6
Hon. Mem.	7	2	0
	£141	17	0

EXPENDITURE.	£	s.	d.
Conversazione	13	6	1½
Deposit	20	0	0
Field Days	11	6	0
Library	12	0	5
Museum	10	8	9
Report	62	0	5
Sundries	1	13	8
Balance	11	2	0½
	£141	17	0

With respect to the above account, it must be observed that the regular income of the Society is derived from subscriptions and profits of the sale of the Reports, which last year amounted to £22 10s. 7d. The expenses of the Museum and Library &c., amount to £24 2s. 5., consequently the regular income is not sufficient to meet the regular expenditure—in fact the constantly increasing expenses connected with the Museum tell very severely on the resources of the Society. The sale of the "Antiquities of Marlborough College" has been put aside to help towards mounting birds, for which the sum of £15 is still required. The "Botanical Garden" is the receipt from the sale of the garden tools &c., when the Society gave up the garden. As the "Composition of Hon. Members" had been spent in getting the garden into order in the first instance, it was deemed advisable to spend their money received for the tools &c, and also to endeavour to replace such further sums as had been given as compositions—£20 has been deposited in the Bank for this purpose.

STANTON PRIZES.

I.—The Subjects for the Stanton Prizes will be divided into two groups:

(i) Botany and Physics.

(ii) Entomology, Geology, and Ornithology.

II.—Candidates will have to pass a Preliminary Examination in the elements of their own subject, and of one other of the subjects set for that year; after which, *if passed satisfactorily*, they will be examined in their own special subjects.

III.—In addition to these two examinations, a certain amount of practical work will have to be sent in.

IV.—The books required for the Preliminary Examination will be—

Botany—Oliver's Botany (chapters, 1, 2, 3, 8).

Physics—Balfour Stewart's Physics (1s. edition).

Entomology—Dallas' Elements of Entomology (chapters 1,2, and 3).

Geology—Bonney's Manual of Geology (1s., published by S.P.C.K.), chapters 1 to 6.

Ornithology—Stanley's History of Birds (2 and 3).

V.—The special subjects, and practical work shall be changed every year, and shall be given out as soon as possible after the announcement of the prizes gained for the previous year.

SUBJECTS FOR 1879.

The prizes this year will be given for Entomology, Geology, and Ornithology.

(1) *Preliminary* Examination, see rule iv.

(2) *Special* Examination.

(a) *Entomology*—Dallas' Elements, chapters iv., v., vi.

(b) *Geology*—Remainder of Bonney's Manual and Jukes' School Manual of Geology.

(c) *Ornithology*—Remainder of Stanley's History of Birds.

(3) Practical Work.

(a) *Entomology* (i)—A Collection of Marlborough Beetles.

(b) *Geology* (i)—A series of Marlborough Chalk Fossils, of all species.

(ii) A Map of the Country four miles round Marlborough.

(c) *Ornithology* (i)—A Calendar of Observations kept from March 1st to June 30th.

(ii) A collection of Bird's eggs, subject to the rules given below, which must be strictly observed.

REMARKS.

As regards the Collection of Beetles, the following conditions must be observed as far as possible.

(i.)—A male, female and underside of each species must be sent in, if possible.

(ii.)—Any *remarkable* varieties may also be sent in.

(iii).—Every specimen must be numbered, corresponding with a number in a note book (which must accompany the collection), in which are given the dates and localities of capture, and any other remarks worth recording.

(iv).—Each candidate must be prepared to certify that every specimen in his collection was either captured or bred by himself.

As regards the collections of Chalk Fossils and Map.

(i.)—In all cases the *localities* where the fossils were obtained, must be given.

(ii.)—Names as far as possible should also be added.

(iii.) As many particulars as possible (especially *localities*) may be written on the specimens, in such places where they would suffer no injury by so doing, but it will also be advisable to number each specimen, by writing on it (not gumming a label), and in an accompanying note book giving all further details.

(iv.)—Besides a typical specimen of each species, other specimens may be added, illustrative of structure or other points of interest, but in all such cases the special points of interest must be mentioned in the accompanying note book.

(v.)—The map should be coloured geologically, patches of gravel or clay carefully marked, also all chalk-pits and cuttings, which may be numbered, so as to serve as a reference map to the note book.

(vi.)—The fullest remarks may be made in the note book, and any remark which results from the actual *observation* of the candidate, will be considered of great importance.

As regards the Ornithological Calendar, candidates are recommended to read a short article on the subject, by Professor Newton, a copy of which is in the Society's Library, but perhaps it may be as well to mention that all remarks about the migration, singing, pairing, nesting, frequency of even the commonest species, are all fit subjects for the Register, besides any unusual or remarkable facts which may be observed by the candidate.

The rules to be observed with respect to the collection of Birds' eggs are as follows :—

(i.)—Only *one* specimen of a species to be collected.

(ii.)—The candidate must be prepared to declare that, to his knowledge, the specimen sent in is the *only* specimen of that species he has taken this year.

(iii).—Should a specimen be broken or damaged so as to render it unfit to be sent in a second may be taken but this must be stated in the note book. No *third* specimen will be allowed.

(iv.)—Each specimen must be marked in ink with a number corresponding with a number in an accompanying note book.

(v.)—In the accompanying note book must be recorded the date when and locality where each specimen was collected, the position and structure of the nest and any other particulars worth recording.

(vi.)—The candidate must be prepared to state that every specimen sent in by him was collected by himself.

REPORT

OF THE

MARLBOROUGH COLLEGE

Natural History Society,

(FOUNDED APRIL 9th, 1864),

FOR THE

YEAR ENDING CHRISTMAS, 1879.

No. 28.

"Tum mihi Naturæ libeat perdiscere mores:
Quis Deus hanc mundi temperet arte domum."

MARLBOROUGH:
PRINTED BY PERKINS AND SON, "TIMES" OFFICE,
1880.

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1880.

PREFACE.

THE work of the Society during the past year has been, perhaps, more complete than in any previous one. In Ornithology it has fallen off, partly from the departure of one or two very energetic observers, but mainly from the very unfavourable weather. It is very curious to note how scarce nests and eggs have been, but from the assistance rendered by Mr. W. Coleman we have been enabled to give one notice at least of almost every bird on our List and have been able to add one or two very important notices of rare birds. In Entomology the work has been decidedly good. P. H. Maddock especially has done very good work in moths and butterflies: and the supplementary aid of N. Manders Esq, has enabled us to give as good a list of notices as we can ever hope to get. A list of Beetles has been added. Meyrick in former years was our only worker in this branch of Entomology and he made out a list of about 540 species, captured by himself or others about Marlborough—to which he afterwards added a few more names. Though no *special* search was made for Beetles, all which were observed were captured and named, and thus at least over 50 additional species were added to the List. If we could only get one or two to work at this branch of Entomology, they will find ample opportunities for distinguishing themselves. In Botany good work has been done and more than the usual number of notices has been obtained by Members of the School. F. S. Alston, D. A. Hailes, P. H. Maddock, A. E. Aldworth have worked very well. We may therefore congratulate the Society on a very successful year. Our "notices" become more and more valuable as time goes on and a larger series is obtained—may the coming year shew at least as much energy as the past!

The Museum has become so crowded that the Committee have been very carefully considering what is to be done. By the removal of some of the contents to the neighbouring Class Room, temporary relief will be obtained. The Collections are all extensive, and with a few more arrangements for their better preservation the College Museum, as it must now be called, will be as good a one as can be found in almost any School.

The Papers read at the meetings have been supplied with considerable difficulty. H. M. Elder has given us several, but yet too many have been supplied by Masters. Miss Preston gave a prize for the best paper read at a meeting by a Member of the School below the VI, but only two candidates appeared. The same offer is again made and the Committee trust that there will be more competition for it.

The Donations to the Museum still continue to flow in. They are duly acknowledged elsewhere, but the Committee cannot help mentioning here the large set of birds, presented by the Marquis of Bath, and the interesting objects from South Africa, presented by A. P. Van der Byl, Esq. To them and to all other kind benefactors the Committee beg to return their sincere thanks.

LIST OF MEMBERS.

President :
Rev. T. A. Preston.

Secretary :
O. Elton.

Treasurers :

Lent and Summer Terms.	*Winter Term.*
Rev. C. E. Thorpe.	Rev. J. P. Way.

Committee :

Lent and Summer Terms.

The Ex-Officio Members.	T. O. Harding, Esq.
G. F. Rodwell, Esq.	W. H. Chappel.
	F. S. Alston.

Winter Term.

The Ex-Officio Members.	H. Richardson, Esq.
G. F. Rodwell, Esq.	F. S. Alston
	H. M. Elder.

Honorary Members :

F. E. Thompson, Esq.	C. Sankey, Esq.	Rev. C. Soames.
W. E. Mullins, Esq.	A. H. Beesly, Esq.	H. P. Dixon, Esq.
Rev. J. Sowerby	F. E. Hulme, Esq., F.L.S.,	W. A. Clarke, Esq.
Rev. G. G. Bradley, D.D.	F.S.A.	Rev. W. M. Furneaux.
C. M. Bull, Esq.	Rev. C. E. Thorpe.	Rev. A. C. Smith.
W. Fergus, Esq , M.D.	Rev. J. S. Thomas	J. B. Fuller, Esq.
S. B. Dixon, Esq., F.G S.	Rev. F. W. Farrar, D.D.,	A. E. Garrod, Esq.
W. H. Macdonald, Esq.	F.R.S.	T. O. Harding, Esq.
J. F. Duthie, Esq.	W. P. Sellick, Esq.	Rev. G. C. Bell.
G. H. Dawson, Esq.	H. C. Spry, Esq.	W. W. Goodchild, Esq.
Rev. A. C. Almack.	G. F. Rodwell, Esq.	L E. Upcott, Esq.
E. F. im Thurn, Esq.	W. D. Fenning, Esq.	W. M H Milner, Esq.
G. K. Mills, Esq.	R. E. Price, Esq.	T. N. Hart-Smith, Esq.
Rev. G. W. DeLisle.	Capt. R. B. Reed.	Rev. J. P. Way.
H. A. Evans, Esq.	H. J. Verrall, Esq.	H. Richardson, Esq.
Rev. J. W. Mills	C. W. Bourne, Esq.	F. S. Hewson, Esq.
W. W. Fowler, Esq.	H. D. Drury, Esq.	Rev. C. W. Tayler.

Members:

LENT TERM, 1879.

E. G. Waddilove
A. E. Aldworth
H. D. Rolleston
J. U. Coates
W. H. Chappel
F. S. Alston
O. Elton
S. R. Baker
C. E. Pine-Coffin
E. C. Vincent
D. A. Hailes
A. Meyrick-Jones
G. B. Routledge
J. P. Clarke
T D. Harrison
S. B. Wilson
P. A. S. Sheppard
G. F. V. Rogers
H P. Highton
P. A. Butler
G. S Chittenden
R. de B. Hovell
A. E. Alderson
C. H. Hooper
H. A. Hartley
C. E. Cooper
C. Hartley
G. P. Rogers
A. J Huleatt
J. W. Adamson
H. A. Dowding
D. C. Boger
R. B. DeChair
H. M. Elder
S. Grant-Dalton

SUMMER TERM, 1879.

E. G. Waddilove
A. E. Aldworth
H. D. Rolleston
J. U. Coates
W. H. Chappel
F. S. Alston
O. Elton
S. R. Baker
C. E. Pine-Coffin
E. C. Vincent
D. A. Hailes
A. Meyrick-Jones
G. B. Routledge
J. P. Clarke
T. D. Harrison
S. B. Wilson
P. A. S Sheppard
G. F. V. Rogers
P. A Butler
G. S. Chittenden
R. de B. Hovell
A. E. Alderson
C. H. Hooper
H. A. Hartley
C. E. Cooper
C. Hartley
G. P. Rogers
A. J. Huleatt
J. W. Adamson
H. A. Dowding
D. C. Boger
R. B. De Chair
H. M. Elder
S. Grant-Dalton
V. B. Tritton
P. H. Maddock
A. P. Glyn
D. L. Bigge
G. G. L. Hadow
H. R. Cooper
J. J. Hammond
F. G. Eyres
G. F. Jessett
H. G. Pryce
M. B. Lloyd.

CHRISTMAS TERM, 1879.

E. G. Waddilove
A. E. Aldworth
F. S. Alston
O. Elton
S. R. Baker
C. E. Pine-Coffin
D. A. Hailes
A. Meyrick-Jones
T. D. Harrison
H. P. Highton
G. S. Chittenden
A. E. Alderson
C. H. Hooper
H. A. Hartley
C. E. Cooper
C. Hartley
A. J. Huleatt
J. W. Adamson
H. M. Elder
S. Grant-Dalton
P. H. Maddock
A. P. Glyn
G. G. L. Hadow
G. F. Jessett
H. G. Pryce
M. B. Lloyd
W. F. Blandford
F. S. Robinson
E. K. Chambers
E. N. Gardiner
H. G. Goodacre.

EXTRACTS FROM THE RULES.

That this Society be called the Marlborough College Natural History Society.

Constitution.

That the Society consist of Members and Honorary Members.

Officers.

That the Officers of the Society consist of a President, Secretary, Treasurer, Librarian, and Curator.

Election of Officers.

That the President have the absolute power of nominating the Secretary.

That those Members of the Committee, who are not ex-officio Members, be elected terminallly, and that the retiring Members be eligible for re-election.

That the same rule apply to the Treasurer, Librarian, and Curator.

Management.

That the affairs of the Society be conducted by a Committee, consisting of the President, Secretary, Treasurer, and four other Members of the Society, two of whom, at least, shall be members of the School, to be elected from and by Members of the Society; three of whom shall form a quorum.

President.

That in case of an equality of votes, the President shall have a double or casting vote.

Secretary.

That the duty of the Secretary be to summon meetings (when necessary) of the Society; to keep a detailed report of the proceedings, as well as lists of Members and Visitors present at each meeting, and generally to act under the direction of the Committee in all matters connected with the welfare of the Society.

Librarian.

That the duties of the Librarian be to keep a Catalogue of the Library, with the names of the donors, and to see that the Library Regulations are carried into effect.

Curator.

That the Curator be responsible for the order of the Museum.

Library.

That any Member of the Society be at liberty to consult any of the books belonging to the Society, but that only certain volumes, to be decided on by the Committee, be allowed to be taken from the room.

Museum.

That members have access to the Museum whenever a responsible Person is present, but that only certain members be allowed access at all times when the Room is not used for school purposes. Application for this privilege must be made to the President.

Field Days.

That the Field Days be confined *entirely* to Members of the Society, and that the President appoint a day on which names must be given in.

Members.

That the election of new Members rest entirely with the Committee.

That every Member pay a subscription of 2s. 6d his first term, and 1s. every subsequent term.

That if a Member be elected after the commencement of the term, the amount of his subscription for that term shall be settled by the Committee.

That Members have the right to introduce two visitors at all general meetings of the Society.

That every Member must be present at two meetings, at least, every Term.

Honorary Members.

That Honorary Members have all the privileges of Members except the power of introducing a Member of the School to the meetings of the Society.

That Honorary Members pay 5s. a half-year, for which they shall be entitled to a copy of the Report.

That Honorary Members may compound for all future subscriptions by the payment of a sum of two guineas.

Suspension of Members.

That any Member be liable to be excluded from the Society by the Committee, if in their opinion, he shall have failed to show sufficient energy in the working of the Society.

Sections.

That the Society consist of sections to be formed for the more accurate study of the different branches of Natural History, and that every Member must belong to a Section.

That the question of the number of Sections be left open for settlement at the beginning of each term.

New Rules.

That any Member of the Society have power to propose any new rule or any alteration in an old one, provided the motion be seconded by another Member.

LENT TERM.

PRELIMINARY MEETING, JANUARY 28TH, 1879.

Meetings were fixed for Thursdays, February 6th, 20th; March 6th, 20th, and April 3rd.

It was also decided that all "first notices" should, as far as possible, be exhibited in the Museum. For the prize for "first notices," the following Rules were agreed to:—

(1) *Plants*—First flowering.

If a Member of the School below the VIth finds a plant in flower within two days of its being found first in flower by a Master or Member of the VIth Form, it shall count to him as a notice.

(2) *Birds*—First song; first egg; hatching; first seen, in the case of migratory birds, all count as "notices."

(3) *Insects*—First specimen.

All specimens to be brought as soon as possible to the Museum, to be duly recorded and exhibited.

There were 19 persons present, 1 Hon. Member; 18 Members.

MEETING HELD FEBRUARY 6TH, 1879.

The President announced the following donations:—

The last part of the *Quarterly Journal of the Meteorological Society*	By the Society.
A collection of limestone Deposits...	By F. L. Wanklyn, Esq., O.M.
A stuffed Otter in case	The Right Hon. the Marquis of Bath.
5 Cases of birds shot near Longleat	
3 Cases of Egyptian Birds, killed in the Winter of 1871-1872	
2 Ostrich's Eggs	

G. F. RODWELL then read an account of his

VISIT TO VESUVIUS.

At the end of the great eruption of 1872 the crater of Vesuvius was left as a wide and deep abyss, the floor of which did not possess a very high temperature, and was free from fumarole. Gradually, however, fumarole appeared, the temperature increased, and large quantities of steam and carbonic acid were evolved. The temperature continued to increase and sulphurous acid made its appearance, finally in 1875 the evolution of carbonic acid diminished, and that of hydrochloric acid commenced. This is always the commencement of the highest stage of fumarole activity. In January, 1875, when I ascended the mountain, large quantities of sulphurous acid were being evolved, and it was quite impossible to descend into the crater. On December 18, 1875, a deep chasm opened in the bottom of the crater, at the bottom of which glowing lava could be seen. This was the commencement of a new period of eruption, which Palmieri predicted would last a long time, and which is still going on. The lava gradually rose to the top of the chasm, and a new eruptive cone was soon afterwards formed on the floor of the great crater. Small quantities of lava issued from time to time from the new cone, and spread over the interior of the crater, until on the night of November 1, 1878, it rose to the lowest portion of the edge of the crater, and began to flow down the great cone of Vesuvius in a north-westerly direction. The lava continued to flow in a somewhat intermittent manner until nearly the end of the year, but it did not go beyond the foot of the cone.

On December 29 last (1878) I visited the new cone. I left Naples at 8.45 A.M., drove to Portici, and walked to Resina. Left Resina on foot at 10 A.M., came upon the lava of 1451 (according to the guide, but I suspect it was lava of 1631) at 10.30, then bore somewhat to the west, and struck the lava of 1858. Reached the observatory at 11.15 A.M., the foot of the cone at 11 45, and the summit of the cone at 12.40 P.M. Thus the ascent of the cone occupied fifty-five minutes, including about ten minutes of rest. The angle is approximately 32°, and the ash of which the cone is composed is very loose. On arriving at the summit we turned to the west, and walked along the edge of the great crater, until we came to its south-western extremity, beyond which it is broken down by the recent flow of lava. Then we descended the crater by a very precipitous path, and presently found ourselves upon the new lava, surrounded on three sides by precipitous walls of apparently not more than 100 feet in height. Facing due north-east, we had on our right the new cone of November, 1878, and on our left the stream of lava which had issued from it, and which was still very hot, and in some places could be seen to be red hot a little distance beneath the surface. Occasionally a puff of very hot air was blown into our faces from the hotter portions of the lava. In many

places hot fumes of hydrochloric acid escaped from the lava, and great cavities (in one or two cases small caverns), from whence the hot acid vapours issued, were coated with brilliant red and yellow sublimates of sesquichloride of iron. These sublimates are constantly spoken of as sulphur. I am inclined to assert that in more than ninety-nine cases out of a hundred, they are sesquichloride of iron formed either by direct sublimation of previously formed chloride from lower recesses in the lava bed, or by the action taking place then and there of the hot hydrochloric acid upon the exposed surfaces of the lava. Sublimations of salt were also apparent in certain portions of the lava bed. Prof. Palmieri informs me that he has detected sulphates in the sublimates, also lithium and boracic acid. I have not yet had time to examine various specimens of sublimates, which were collected from the new lava, and were placed in a dry bottle as soon as I reached Naples.

Prof. Palmieri has kindly furnished me with a MS. account of "Il Vesuvio dopo la grande eruzione del 1872," from which some of the above facts were derived. My own recent experience on the mountain does not, however, allow me to agree with him when he says "Comunque sia, in tutto il tempo trascorso il cratere ha di mostrato poca attivita dinamica. Pochi brani di lava gettati fino all' altezza di 20 o 30 metri, soffii piu o meno vigorosi e qualche rara detonazione han rappresentato il vigore della forza eruttiva" The new cone, when I saw it, was pouring out vast volumes of smoke and steam, detonations occurred at frequent intervals, and loud noises as if of the lava surging within the crater. At intervals also, the smoke was intensely illuminated as if the lava had leapt up within the cone. The cone discharged a perpetual shower of red-hot pieces of lava of a more or less cindery character, and certainly to a height far exceeding the "20 o 30 metri" of Prof. Palmieri. It is difficult to judge of heights under such circumstances, but many of the fragments appeared to be projected to a height equal to that of an ordinary sky-rocket. The ejected masses nearly all fell on one side of the cone, and helped to raise it. Occasionally, however, a sudden burst would come which scattered the red-hot masses in all directions. We approached as near as we could to the cone, and stood upon the bank of cinders in immediate contact with it, and not a dozen yards from its vomiting crater. Showers of red-hot stones were projected from the crater, many of which fell into it again, and the rest for the most part on the side remote from us. There came a sudden burst, however, which shook the ground under our feet, and scattered red-hot masses in all directions. A piece weighing four ounces fell within six feet of where I was standing, and the guide ran up to it and pressed a copper coin upon its still soft surface. A few minutes later a piece of red-hot lava, weighing at least seven times as much as the preceding, fell within four feet of me, and I

promptly retired to a safer distance. Fifteen days before a guide had been killed by a falling red-hot stone from the crater. The projectiles from the crater are doubly dangerous, because you cannot "dodge" them. They do not come down straight like a cricket-ball, but waver in their flight like a boomerang. In the case of the larger of the two masses which fell so near to me, I had not only time before it fell to watch it in the air above my head, but also to speculate as to where it would fall. Judging by its position when about forty feet from the ground, it would certainly, I thought, fall behind me; a moment later it swerved, and fell about four feet in front of me. The cone, with its lurid smoke, and loud detonations, and showers of red-hot stones, presented a most fascinating spectacle. What, then, must be the effect when the whole great cone of Vesuvius is in a like condition?

The new lava is very leucitic, and does not resemble that of 1872. When in a viscous state it can easily be drawn into threads, and when cold it is jet-black and possesses a fine lustre.

Chloride of ammonium does not appear to have been at all a common product in this eruption, although it was conspicuously present during the eruption of 1872. Great differences of opinion still exist as to the formation of sublimates of chloride of ammonium in lavas. Bunsen considers that it is mainly formed by the action of the hot lava upon vegetable soil, and he has proved that "a square metre of meadow land yields on dry distillation a quantity of ammonia corresponding to 223·3 grammes of chloride of ammonium." Palmieri, while he admits that he has found more chloride of ammonium in those portions of lavas which have passed over cultivated ground, asserts that he has also found it high upon Vesuvius far above the range of vegetation, and in localities where the new lava has simply flowed over older and perfectly barren lava fields. He accounts for its formation by supposing that aqueous vapour undergoes dissociation in the heated crevices of the lava, and that the nascent hydrogen combines with the nitrogen of the air to form ammonia. We do not know what chemists will have to say to this theory.

Not far from the active cone I found a very interesting specimen of volcanic cinder which had obviously been exposed to the action of hydrochloric acid at a very elevated temperature, and had then probably been ejected before the action was complete. The central portions consisted of undecomposed cinder, and this was surrounded by a thick layer of perfectly white decomposed substance consisting chiefly of silicate of alumina and silica; the hot hydrochloric acid having formed sesquichloride of iron with the iron in the superficial layers of the mass, which sesquichloride had been afterwards volatilised out of the mass. By passing hydrochloric acid over lava heated to redness in a porcelain tube, the same effect was produced, the portions of

lava most strongly heated, and longest submitted to the action of the hydrochloric acid, became perfectly white, while a copious sublimate of chloride of iron and chloride of aluminium passed into the receiver.

I ascended from the new lava (viz., from the bottom of the great crater of Vesuvius), at 1.30 P.M., ran down the sides of the great cone, which had taken fifty-five minutes to climb, in seven minutes, reached the observatory at 2.30 P.M.; Portici, by a roundabout way to the west near Monte Somma, whither we went to search for minerals, at 4.30 P.M.; and Naples at 5.40. The next evening while steaming out of the bay, *en route* for Tunis, I noticed that the smoke at the apex of the mountain was ruddy from the reflection of the lava within the small crater of 1878, and then for many days after, the summit of the mountain was obscured by clouds, and snow lay upon it when I next saw it towards the middle of last January (1879).

T. O. HARDING, Esq., gave a description of the Seismometers used at the Observatory on Vesuvius, by Professor Palmieri. From an electric battery pass two wires, one immersed in a vessel of mercury, the other just not touching the surface When an earthquake occurs, the surface of the mercury is agitated and touches the second wire, by which means a circuit is formed, and the force of the shock duly recorded on a sheet of paper kept moving by clock-work, and properly ruled. In order to prevent a waste of paper in recording long intervals between any two shocks, an arrangement of two clocks is so made, that when the first is going the second (which moves the paper) is stopped. As soon as a shock occurs, the first clock stops and the second goes on, so that the exact time when the shock occurs can be told from the first clock, and duly noted on the recording paper.

Two other Seismometers were mentioned—one, a bowl of treacle, the other a bowl of mercury with a series of holes in the sides, just above the surface of the mercury. In this latter, as soon as a shock occurs, the bowl tips to one side, and a certain quantity of mercury flows out through the holes; in this way the *amount* of the shock can be approximately estimated, and also the *direction*, it being observed through which of the holes the majority of the quick-silver escaped.

There were 68 persons present; 4 Hon. Members; 29 Members; and 35 Visitors.

MEETING HELD FEBRUARY 20TH, 1879.

H. M. ELDER read a paper on

THE SPECTROSCOPE,

Illustrated by Diagrams, &c.

I PROPOSE this evening giving you a short history of the Spectroscope, from the time of Newton to the present day, and indicating its powers and the chief uses to which it has been applied. But first, I should like to say a few words about light and its properties, to shew you the sort of thing we have to deal with.

In the first place, what is light? You may scarcely believe me, I dare say, but it is supposed to be nothing more than *motion*, a sort of wave-like motion, taking place in some peculiarly thin and elastic medium, supposed to pervade all space, even a vacuum, and going by the name of *Luminiferous Ether*. I say purposely *supposed*, for Newton used to think that light was caused by a series of little particles, shot out from the source of light, and striking against the eye; and he was followed in this opinion by many scientific men for a long time. There is yet another theory, proposed by Prof. Clerk Maxwell, of Cambridge, which depends on Magnetism, but which I need not explain now, as the wave theory is quite good enough as yet; but still you should remember that it is only a theory, a supposition, and not a proved fact.

This theory, or as it generally called, the *Undulatory theory* of light, was first proposed by an Englishman, Hooke, but worked out to perfection by Christian Huyghens, who was a few years older than Newton, and after whom it is called.

Most people at present imagine that light is merely a series of waves which strike against the retina or black screen at the back of our eye. These waves are so small, that on an average it takes 50,000 of them to reach an inch, and so quickly do they follow one another that over 600 billions (600,000,000,000,000) of them beat against the eye in one second, and their motion goes along at the rate of 186,000 miles a second; which means that a flash of light takes 8½ minutes to reach us from the sun, or that if the sun were suddenly to go out we should not know it for 8½ minutes. I should like you to understand this wave structure of light thoroughly at first, so that you may not only see that the Spectroscope does certain things, but why it does them; and why, instead of being surprised at what it does we should be surprised if it did not act in the way it does act.

When light strikes perpendicularly, or uprightly on the surface of a transparent body like glass or water, it goes straight on and nothing happens; but when it does not come perpendicularly, but in a slanting direction, part of it is reflected or turned back and does not enter the glass at all, and part goes in, but in doing so is bent down away from the surface

of the glass, or as it is called, *refracted*. In the opposite way when light goes from glass or water into air it is bent towards the surface of the glass as it comes out to just the same extent that it was bent when going in, so that a ray of light goes along the same lines when going into or coming out of a denser medium; and if it has to cross one like a pane of glass, it takes up the same direction on getting out of the glass as that in which it was travelling before it went into the glass. I think I can give you some notion of why this happens, or at all events shew that it is what we should expect by quoting a parallel instance given by Sir John Herschel, in one of his papers on light. He tells us to imagine a line of men marching on smooth ground obliquely towards a piece of rough ground. They will, if they keep straight on, not all step on to the rough ground at once, but the man at the end of the line nearest to it will step on first, and the rest one after the other, in order, as each man reaches it; but, as each man steps on he will be obliged to take rather shorter steps, and so will lag a little behind his proper place, if he still keeps step; then by the time the whole line is on the rough, the first man will be some distance behind the place where he would have been if there had been no rough ground, and the next a little less, and so on, and therefore the line will be facing in a little different direction to that in which it was going at first, and as it marches straight on, it will be marching in a slightly different direction, and in this new direction they will keep on until they reach the other side of the rough ground, when the process will be exactly reversed, the first man will take longer steps again, and so on with each man as he gains the smooth ground, and the whole line will march on in a direction parallel to its first one, but a little behind the place it would have been in if the rough ground had not been there. But now suppose the rough ground to be triangular in shape, so that the new direction of march of our line of men strikes the opposite side in a direction such that the man who came on to the rough last goes off first, and begins to lengthen his step first, then the one who went on first will lengthen his last, for he will come off last, and his end of the line will lag still further behind, and the direction of march of the whole will be turned still more round. This is just the sort of thing that happens to light waves, *i.e.*, the direction of a ray of light is bent on entering a glass or other prism, just as the direction of march of the men is by the rough ground. I want you to keep this illustration in mind as I shall have to refer to it again, after describing Newton's experiments, with which the history of the Spectroscope really begins.

You must have all noticed at some time or other how, if you hold a prism up to your eye it not only seems to alter the position of objects seen through it, but tinges them with the colours of the rainbow. This power of a prism

to bend aside a ray of light, and to shew the so-called *prismatic* colours was well known before Newton's time; but he was the first to investigate it by experiment. Shortly after 1669 he was looking for the causes of indistinctness in telescopes, and was led in the course of his experiments to pass a beam of light through a hole in a shutter, and then through a prism. He was astonished to find that the image received on a screen, besides shewing the rainbow colours, was drawn out into an oval shape, instead of being round like his hole in the shutter. He tried the experiment in various ways, and at last felt sure that it was owing to no irregularity in his prism. Then the idea struck him of passing each colour again separately through his prism, and so trying if it was further divided; accordingly he pierced a hole in his screen and found that after passing the light through a second prism, no colour was affected by the second refraction, and the different colours were bent aside each to a different degree, the violet most, the red least, and always in the same order, whether he used a prism of glass or any other material, though they were not always spread out to the same extent. This led him to the conclusion, that *white light is not homogeneous, but consists of various lights of different colours, some of which are bent aside by a prism more than others.*

Then Newton argued that if white light or sun-light was made up of fixed number of distinct colours, and he could disperse them far enough apart, they would not over-lap, and instead of a continuous band of light shading off from red to orange, orange to yellow, and so on to violet, without any breaks or gaps, he would get a series of spots the shape of his opening, through which the beam of light came, and separated from each other by dark spaces; thus he would have spots of red, orange, yellow, green, blue, indigo, violet, and between each pair a black space. However, do what he would Newton could not manage to make any gaps apparent on his screen, so he concluded that the light shaded off quite continuously from one colour to the next without any break whatever.

But though wrong in this case, Newton made one discovery of great practical importance to later opticians in making spectroscopes. He found that to get the purest and best spectrum, the light ray to be observed must so come out of the prism that the angle it makes with the face it issues from is equal to the angle between the compound incident ray and the face it strikes on. This is generally expressed by saying that the prism is used at its "*angle of minimum deviation.*" With this Newton left the subject.

By now you must be wondering why it is that the light ray besides being bent aside by the prism, is spread out and decomposed or split up. To explain this we will return to our line of men for a moment. Last time we used them they were just an ordinary line of soldiers, and kept step as

well drilled soldiers should; but now suppose that though walking at the same rate and keeping in a line, they are not keeping step, but some are stepping short and quickly, and others longer and more slowly. For instance take two men one of whom steps say thirty-six inches at each step, but the other only half as much, *i.e.*, eighteen inches, and therefore has to step twice as often to keep the line unbroken. Now suppose when they get on the rough ground that it causes each man to shorten his step six inches; then the first man will step thirty inches each step, but the second while he is doing this will take his shortened step twice, *i.e.*, will step twelve inches twice, in all, twenty-four inches, and will fall out of his place in the line. Then when they get to the opposite side of the rough ground, the short stepping man will come behind the long stepping one and his direction of march will be turned more round. Well again, as before, it is just this sort of thing that light waves do; red light makes, so to speak, 514 billions (514,000,000,000,000) of steps in each second, that is 514 billions of waves of red light beat against the eye in one second; but of violet there are no less than 750 billions (750,000,000,000,000); so you see the waves or steps of red light are about half as long again as those of violet, and therefore violet gets bent aside more than red; and the same thing happens with the other colours; red is bent least of all, next in the following order—orange, yellow, green, blue, indigo, and violet most of all.

Wollaston was the next to make important experiments on this subject, and he succeeded where Newton failed. Newton's method of proceeding, by passing his light through a hole in a shutter, round, square, or triangular as the case might be, and receiving his spectrum on a screen was very crude and rough, but Wollaston decided to pass his light through a narrow slit and receive the image on his naked eye, instead of on a screen. This, though it would be thought crude enough now, was successful, and in 1802 he observed a few dark gaps in Newton's continuous band; he thought though, that his discovery was more curious than important, and left it for Fraunhofer to examine and carefully map these black lines.

Twelve years after Wollaston, Fraunhofer in Germany, still further improved the instrument, for now it became worthy of that name, by adding a telescope for observing the spectrum, and magnifying it before receiving the rays on his naked eye. By this means he distinguished and mapped no less than 576 dark lines or gaps in the solar spectrum, and named the most important of them after the letters of the alphabet. But not content with observations on the sun alone, he turned his spectroscope towards the moon, the planets, and the stars, and made the most astounding discoveries there of which we scarcely yet know the full significance. His discoveries and observations were considered so important that all these dark lines were

called after him *Fraunhofer's lines*. Since this at least two thousand if not more of these beautiful dark lines have been mapped and their significance declared, at all events in part. Mr. Norman Lockyer at the present time is preparing a map of them more than *a hundred yards* long.

The last improvement of any importance to the working of a spectroscope was added by Mr. Simms; he placed a lens between the slit and prism in such a position that the slit was in the focus of the lens. This rendered the rays of light from the slit parallel, and made the definition on the other side clearer. After this the improvements, though many, are less important, being chiefly arrangements for measuring the positions of lines, or making a battery of prisms automatically arrange themselves at the angle of minimum deviation. But there is one modification of the spectroscope that I must not omit, since it has resulted in the production of a pocket spectroscope, only three inches long. It is a method, due in the first instance to Amici, of arranging prisms, so that the light is not bent round, but only dispersed, and the observer looks straight towards the object that he is observing. Various kinds of glasses refract to different degrees with different amounts of dispersion. For instance a prism of flint glass spreads out or disperses the light far more for a given amount of deviation or bending aside than a prism of crown glass. So if a flint glass prism have its deviation corrected by prisms of crown glass refracting in an opposite direction, the light will still come out in a straight line with the entering ray, but a certain amount of uncorrected dispersion will be left over, and a short spectrum will be formed. In Browning's little pocket spectroscope there are seven prisms combined in this way, and with it can be seen all the principal Fraunhofer lines in the solar spectrum.

We now come to the power and work of the spectroscope. I shall first speak of the phenomena of radiation, and after that those of absorption, and then I will try to point out the work that has been done by it in the sun and among the stars.

In 1822 Sir John Herschel seems to have made the first step towards spectroscopic chemistry as it is now understood, for in speaking of the spectra of Strontium, Copper and some other substances, he says: "The colours thus communicated by the different bases to flame afford in many cases a ready and neat way of detecting extremely minute quantities of them." And a few years later Fox Talbot remarks: "A glance at the prismatic spectrum of flame may shew it to contain substances which it would otherwise require a laborious chemical analysis to detect."

Now it is a known fact that every element has its own peculiar spectrum of bright lines when heated sufficiently in a *gaseous* state. For there is a great difference between the spectrum of a hot solid and a hot gas. If you heat a platinum wire and examine it with the spectroscope, when it first

begins to glow red, there is a faint light at the red end of the spectrum; then you go on increasing the temperature and the wire gets hotter and brighter, and the spectrum gets colour after colour added towards the violet end till, when the wire is white hot, you have a perfectly continuous spectrum extending from red to violet without a break. This happens in the case of almost every solid and liquid, so that there is no way of analysis possible by the heating and examination of solids or liquids. But, if you heat a gas the case is different. If an electric spark be passed through a Geissler's tube containing a so-called vacuum of Hydrogen, the gas is heated so intensely that it glows red; but it cannot be made to glow white like a platinum wire, and it has a very different spectrum. Many of you saw it last summer in the Bradleian. It consists of four lines, called by Fraunhofer C, F, G, and H; where C is red, F green, G indigo, and H violet In the same sort of way if a little salt be put in the flame of a spirit lamp the flame becomes yellow, and the spectrum of sodium vapour can be seen, *i.e.*, a pair of yellow lines very close together indeed, so close that in most charts they are represented as one single line.

Since I have shewn the spectrum of a heated solid is continuous, here at first sight we have a means for telling whether a heated body is solid or liquid, or gaseous, at least in the majority of cases, for if a gas be heated under very great pressure it gives a continuous spectrum like a solid or liquid. This then has solved for us the question of the constitution of a candle flame, for since it gives a continuous spectrum, its light must proceed from an incandescent solid source. That is, the light of a candle is thrown out by little *solid* incandescent particles of carbon.

Not only can we tell the constitution of bodies, but since every element has its own peculiar bright line spectrum, the appearance of any known spectrum is enough to determine the presence of the element to which it belongs. To observe the spectrum of any substance, it can be heated in several ways; if it is a gas, Geissler's tubes are best. The commonest way of examining a solid substance is to heat it in a Bunsen gas flame, but this only answers when the substance is pretty volatile. The best way of all is to make a little solution of the substance, and to pass an electric spark from the surface of this to a point of platinum wire; this spark always gives a very good and well defined spectrum.

With these precautions, this method of analysis is the most delicate that can be imagined; Bunsen and Kirchhoff have calculated that the eighteen millionth ($\frac{1}{18000000}$) part of a grain of sodium is detectable by it. Lithium can be discovered if the six millionth ($\frac{1}{6000000}$) part of a grain be present; and through this Lithium has been shewn, instead of being a very rare metal as was before supposed, existing in only four minerals, to be really

universally distributed; it is found in the ash of cigars, in blood, milk, tea, grapes, sugar, and many other bodies; and Dr. Miller has shewn that in the Wheal Clifford mine, no less than 800 lbs. of Lithium are given out every twenty-four hours, and yet before the spectroscope was used none was known to exist there. Strontium can be discovered if only a millionth part of a grain is in the substance for analysis.

The spectroscope can be used to analyse a very complex nature of substances, and this is one of the neatest uses it can be put to, for it may save an almost hopelessly long chemical analysis. I have myself seen in the spectrum of a liquid that was being examined for Gallium the lines of Nitrogen, Hydrogen, Zinc, Calcium, Cadmium, and Gallium. So there, by one neat experiment taking perhaps two minutes, the presence of four elements was made sure of; and this if done by chemical means would after hours of work, as far as Gallium was concerned, have resulted in utter failure. I say four elements were found, because Hydrogen was present from the water and Nitrogen from the air.

I have just been speaking of Gallium, and that reminds me of another exploit of this wonderful instrument In 1860, Bunsen was examining the water of a spring near Dürckheim, and he saw some lines that he did not recognise, though he was well acquainted with all the then known spectra. He trusted his instrument, and evaporated down no less than forty-four tons of Dürckheim water and succeeded in discovering Caesium and Rubidium. In 1857, Mr. Crookes found in some pyrites from the Hartz mountains another metal which he called Thallium from the beautiful green line in its spectrum. In 1863, Reich and Richter found Indium in some Freiburg blende. In 1875, Lecoq de Boisbaudran discovered Gallium in some Pyrenean blende. So altogether five new metals have been found by the spectroscope.

Mr. Bessemer has made use of the spectroscope in his method of manufacturing steel. In this cast iron, which contains a very great deal of carbon, is urged at a white heat by forcing air through it in what is called a Bessemer crucible until just enough carbon is burnt off to leave good steel; if it is forced for ten seconds too much or too little, the whole affair is spoilt. Mr. Bessemer noticed that when certain lines of carbon disappeared from the spectrum of the incandescent vapours given off by the hot steel, it was just finished and time to stop the current of air; so that an observer at the spectroscope has only to give the word when certain lines disappear, the bellows are stopped and the steel is perfect.

The spectroscope has done the doctors some service already and will no doubt do more. Dr. Bence-Jones has hit upon a method of solving some questions connected with the circulation of the blood by means of spectrum analysis; but I need not enter into his experiments now, for I think I have

shewn quite plainly enough that in only a small portion of the work it is called upon to perform the spectroscope is truly a Hercules.

Now I will describe the phenomena of absorption. I have already mentioned Fraunhofer's lines in the solar and stellar spectra, and I shall soon be in a position to explain them; but, though they are without doubt the most important points to be noticed in absorption spectra, I do not care to get among the stars before I have done with the earth, so I will keep for the present to terrestrial phenomena.

If you look at any thing white through coloured glass or coloured liquids or gases it looks coloured, and curiosly enough often not the same colour as the glass or other body. This platino-cyanide of magnesia is red by reflected light, but if you hold it up and look through it, it looks green. The reason of this is that the coloured glass stops or as it is called absorbs part of the white light which as you know is really made up of different colours. In the case of the platino-cyanide of magnesium the green rays are allowed to pass and the rest stopped, if it had looked purple only the red and blue, perhaps, would have been allowed to get through. Brewster, in 1832, was the first to experiment on this with his spectroscope. He found that if sunlight was allowed to pass through certain vapours such as red nitrous fumes, or Iodine, or Bromine, the spectrum was crossed by certain dark bands that differed for different vapours, even those which were of the same colour, such as red nitrous fumes and Bromine. Absorption spectra of various liquids can be procured, and these are quite as important, if not more so than radiation spectra, seeing that they give us a hold on organic chemistry, and they are certainly more pleasant and clean to work with. The plan is to throw a beam of light, either sunlight or any other source which gives a continuous spectrum such as the electric light, the lime light, or even a paraffin lamp, through a cell containing the liquid to be examined. Messrs. Sorby and Browning have invented and produced what they call a "micro-spectroscope," or a combination of a microscope and direct vision spectroscope for examining very small quantities of liquids by this means. Speaking of absorption spectra Mr. Norman Lockyer says "The means of research spectrum analysis affords as far as regards radiation is entirely reproduced in the case of absorption, and it is perfectly easy by means of the absorption of different vapours, and different substances held in solution, to determine not only what the absorbers really are, but to determine the presence of an extremely minute quantity." As an instance of this I may mention that Mr. Sorby has applied his micro-spectroscope to the study of blowpipe beads, and finds that he can sometimes detect portions so small as the ten thousandth $(\frac{1}{10000})$ part of a grain of some bodies, such as Copper, Cobalt or Chronium, even when mixed with other colouring matters.

Absorption spectra bear somewhat the same relation to organic chemistry that radiation spectra do to mineral chemistry; Professor Stokes has discovered by their absorption bands two distinct forms of cruorin or blood colouring matter which he names red and purple cruorin; and Mr. Sorby has succeeded in detecting five different kinds of colouring matter in the leaves of plants, whose names I will not mention, for they are neither short nor sweet.

Absorption spectra promise to be very useful in the examination of blood; Mr. Sorby has used his spectroscope in criminal cases, and has succeeded in detecting haematin in a blood spot so small that it only contained a thousandth part of a grain of blood. A German, by name Herr Vierordt, has made some experiments on living blood, by examining the red light that passes between the fingers when they are held close together and held up to the sun. This red light shews the absorption bands of oxyhaemoglobin, and Herr Vierordt's experiments were to find out how long it took for bright arterial blood to be converted to dark venous blood by the reduction of oxyhaemoglobin to haemoglobin.

Scarcely less wonderful than these experiments on blood are Mr. Sorby's experiments on wine and beer; he can, he says, detect the least portions of artificial colouring matter in them, and in the case of wines he was able by the absorption bands to tell accurately the year of vintage of each wine that was submitted to him, under ten years old, after which age he could only tell approximately.

By far the best known and most celebrated work that the Spectroscope has done is away from the earth, and of this I will give some account, having purposely omitted to mention it before. I spoke a short time ago of Wollaston's and Fraunhofer's discoveries of dark lines in the solar spectrum; I daresay by now you have guessed that those dark lines are really absorption bands, if so you will be quite right. Fraunhofer noticed in his experiments that the yellow double line of sodium exactly coincided with the double dark line marked D in the sun, and suspected that there was some strange hidden connection between them, but could offer no explanation nor even confirm his suspicions. Dr. Brewster, again, discovered that in the spectrum of the combustion of nitre on charcoal, *i.e.*, that of Potassium, there are two bright lines exactly coinciding with Fraunhofer's dark ones A and B, and then expressed *his* conviction that there was some connection between them. To shew the meaning of this connection I will quote Kirchhoff's description of his experiment, which finally demonstrated it, in his own words. "In order," he says, "to test in the most direct manner possible the frequently asserted fact of the coincidence of the sodium lines with the lines D, I obtained a tolerably bright solar spectrum, and brought a

flame coloured by sodium vapour in front of the slit, I then saw the dark lines D change into bright ones. In order to find out the extent to which the intensity of the solar spectrum could be reduced without impairing the distinctness of the sodium lines, I allowed the full sun light to shine through the sodium flame. To my astonishment I saw the DARK lines D appeared with an extraordinary degree of clearness. I then exchanged the sunlight for the Drummond or oxyhydrogen lime-light, which, like that of all incandescent solid bodies, gives a spectrum containing no dark lines. When this light was allowed to fall through a suitable flame, coloured by common salt, (chloride of sodium), *dark* lines were seen in the spectrum in the position of the sodium lines." Now putting these facts together with like experiments made by Stokes, Stewart, A. Angstrom, Foucault, and Bunsen, the following law was deduced:—"GASES AND VAPOURS WHEN COOL IN COMPARISON WITH THE RADIATING SOURCE OF LIGHT, ABSORB THOSE SAME RAYS WHICH THEY THEMSELVES EMIT WHEN INCANDESCENT." Hereupon, Kirchhoff asked himself what those dark solar lines meant; he was not quite satisfied, but he more than suspected so he took instead of sodium the most complicated spectrum he could find, *i.e.*, that of Iron. Now the spectrum of Iron is crossed by lines throughout its whole length, no less than ninety lines being known to Kirchhoff, while now 460 and more have been mapped. He compared the spectrum of Iron with the solar spectrum, and found dark lines absolutely corresponding with his Iron lines. Then treating it as a matter of probability, and taking the chance for each coincidence as ½, *i.e.*, as even odds, he deduced the immense odds of considerably over 1,000,000,000,000,000,000,000,000 to one against the observed coincidence, while now that so many more lines are known, the odds against the observed coincidence would be over 2980, followed by a hundred and thirty-five noughts to one against the observed coincidences. It is perfectly inconceivable that these coincidences should be accidental then, and so Kirchhoff argued that since the light is absorbed in such a way, there must be iron vapour to absorb it, and it cannot be in our atmosphere, for if so the lines would get more marked as the sun sank and had to shine through thicker and thicker beds of air. *Therefore the Iron must exist in the sun itself.*

So Kirchhoff finally decided:—"*There is a solid or liquid something in the sun, giving us a continuous spectrum, and around this are vapours of sodium, of Iron, of Calcium, of Chromium, of Barium, of Magnesium, of Nickel, of Copper, of Cobalt, and of Aluminium; all these are existing in an atmosphere, and are stopping out the sun's light. If the sun were not there and if these things were observed in an incandescent state, we should get exactly these* BRIGHT *lines from them.*"

Though Kirchhoff quite satisfactorily proved that these absorption bands were really caused by the vapours of the elements they belong to being present, it is interesting to know that Prof. Young, of Princeton, U.S., has made the certainty absolute, and beyond the reach of probabilities, by seeing the bright lines themselves. He thought that the vaporous atmosphere, which generally absorbs rays, would, if observed just at the moment when in a solar eclipse, the body of the sun was obscured, shew the bright lines corresponding to each dark line in the spectrum. So at the total eclipse of December, 1870, he directed his spectroscope towards the sun's edge. He watched the usual continuous spectrum grow fainter and fainter, and at last just as it disappeared there flashed out for a few seconds in all their marvellous beauty the thousands of bright lines of that atmosphere which ordinarily produces the black absorption Fraunhofer lines.

Here is a list of the bodies at present recognized in the solar spectrum:

Sodium	Chromium	Cobalt
Calcium	Nickel	Hydrogen
Barium	Copper	Manganese
Magnesium	Zinc	Aluminium
Iron	Cadmium	Titanium

To these may be added Helium, a metal not found on the earth, unless, Mr. Norman Lockyer seems to think, it is a form of Hydrogen.

Mr. Henry Draper has detected the bright lines of Oxygen, and he also thinks of Nitrogen in some photographs of the violet and indigo parts of the solar spectrum. I mentioned before that Fraunhofer had turned his spectroscope towards the moon and stars, and had seen the same sort of spectra as we have in the sun. With regard to the moon, this is important as proving the absence of a lunar atmosphere; for since the moon shines with reflected *solar* light, if it had an atmosphere we should see the absorption bands of that atmosphere as we do those of our own; and, as a matter of fact, none are seen, and the usual atmospheric lines are not even strengthened. With regard to the planets in some cases the spectroscope has shewn an atmosphere to be present.

Messrs. Huggins and Miller have applied the spectroscope to the stars in the same way that Kirchhoff did to the sun, and have succeeded nearly as well. They have found no less than seven terrestrial metals in Aldebaran, and among them Hydrogen, Sodium, Iron and Calcium. In Betelgeux, another large star, six metals have been recognised, and among these Iron, but apparently not Hydrogen. In Sirius, the brightest of the stars in our hemisphere, the Hydrogen lines are very heavily marked, and Sodium and probably Iron have been detected. And now let us see where this leads us. All these stars are suns like our own, and apparently of nearly the same

composition; they probably have planets and worlds circling round them, as we do round our sun; these planets are probably of the same composition as their central luminary, just as we are like ours. Therefore they, probably, or at least some of them, are like our earth. And what is to prevent their being inhabited by rational beings? The presence of Hydrogen makes the existence of water almost a certainty, and the presence of Iron leads us to think of beings who know how to work it, and work with it, and opens up to our imagination myriads of worlds like our own, where arts and sciences flourish much as they do here, and perhaps the spectroscope is among their scientific instruments.

As yet I have confined myself almost entirely to the relations of the spectrum with regard to chemistry, and have barely hinted at the insight it gives us into a body's internal structure and state of aggregation. And yet chemistry is but one of the accomplishments of this extraordinary instrument. For instance take the spectrum of Hydrogen in a Geissler's tube; it consists of four well marked lines, and at a lower temperature and pressure three of these may be made to disappear, leaving only F. As the pressure is increased these lines widen out more and more, until at some considerable pressure the spectrum at last becomes continuous. Here you see at once is a great extension of the spectroscope's work. Mr. Norman Lockyer gives a very good experiment shewing that the same thing happens in the case of absorption as in that of radiation. I will quote his own description of it. "If we take a tube," he says, "containing some metallic sodium sealed up in hydrogen, and pass a beam of light from the electric lamp through it; by decomposing this beam with our prisms, we shall obtain an ordinary continuous spectrum, without either bright or dark lines; but by heating the metallic sodium in the tube which is placed in front of the slit, we really fill that tube with the vapour of sodium; and as the heating will be slow, the sodium vapour will rise very gently from the metal at the bottom, so that we shall get layers of different densities of sodium vapour filling the tube. Immediately the sodium begins to rise in vapour, a black absorption line shews itself in our spectrum in precisely the same position as the yellow line of Sodium, and you will find that the thickness of the Sodium absorption line will vary with the density of the stratum of vapour through which it passes. Thus from the upper part of the tube we obtain a fine delicate line, which gradually thickens as we approach the bottom of the tube." And thus we see the effect of pressure in the case of sodium vapour. In the case of magnesium vapour it is still more extraordinary. Magnesium has three lines marked *b* in the solar spectrum, one of them thinner than the other two; and if the pressure on magnesium vapour is reduced sufficiently this thin line disappears entirely. These facts have helped astronomers consider-

ably in investigating sun spots, for if a sun spot be focussed on to the slit the Sodium lines are considerably increased in width, thus proving that sodium vapour is there present at a higher pressure than ordinarily on the sun's surface.

Before the advent of the spectroscope the character of these strange nebulae of which we sometimes hear was very doubtful indeed. Many people thought them all star clusters, so far removed that they seemed like a cloud, and distinct separate stars were invisible; in fact other universes of stars like the one in which our sun is moving. Some indeed were by telescopes of increased power resolved into star clusters, and it was presumable that all would be in the end, yet very many, in fact the greater number were still left unresolved. But when the spectroscope came to the work matters were somewhat changed. Among sixty nebulae observed by Huggins twenty are resolved and give continuous spectra, forty are not resolved; of these twenty-one give continuous spectra and are presumably resolvable, nineteen give discontinuous or bright line spectra and are certainly gaseous. But yet more than this; these gaseous nebular spectra are extremely peculiar spectra. That of the nebula in Aquarius gives three lines; one due to Nitrogen, one coinciding with the Hydrogen line F, and another which does not coincide with any line of any element as yet tried against it. Well, you will say, so far so good, —Hydrogen, Nitrogen, and something else are present in a glowing gaseous state. Quite so! But where are the other lines of Nitrogen and Hydrogen? What has become of C, G, and H? Mr. Lockyer and Dr. Frankland have found the clue to this. They found it perfectly easy to obtain, and sometimes when they did not want it, a spectrum of Hydrogen or Nitrogen giving one line, or nearly so. For instance a single line of Hydrogen only is visible when the pressure on the Geissler's tube is so slight that you would say the tube really contained nothing at all, and when the temperature is comparatively low. What then is the inference? It is that these nebulae consist of growing Hydrogen and Nitrogen at an exceedingly low pressure and a comparatively low temperature.

With nebulae are generally associated comets, and of these the spectroscope has told us something, though not so much as about other things. The first comet of which the spectrum was observed was Donati's in 1858; its light was found to give a banded spectrum by its discoverer himself, but he did not notice carefully the position of the bands. In 1868 two small comets, Brorsen's and Winnecke's, were examined by the spectroscope, and Huggins found that their banded spectra coincided with that of carbon taken by the electric spark both in olive oil and olefiant

gas, hence he deduced that comets may be considered to consist of some carbonaceous gas, but what there is no evidence to shew.

The great comet of 1874, that most of us I should think remember, was very carefully examined. Mr. Huggins observed three different spectra in it. First, a spectrum of bright bands, apparently carbon bands, like those in Brorsen's and Winnecke's comets. Second, the continuous spectrum of the nucleus on which the bright band spectrum was superposed. Third, the continuous spectrum of the tail. It became doubtful whether the continuous spectrum was due to the light of the sun reflected by the comet, or to its own peculiar light. Mr. Lockyer thinks there is evidence to shew that it is a spectrum of mixed gases. At all events the one thing certain about comets is that three which have been examined, and probably four, contain carboniferous gases.

Speaking of comets leads us on to meteors or falling stars. You would think it must be a difficult matter to get the spectrum of one of those very evanescent bodies, but Browning, always equal to the occasion, has invented a plan by which, without moving the spectroscope, any meteor once within the field of view is kept there during its whole course. Alexander Herschel, and Secchi have examined the August and November meteors and find the sodium line distinct in the track of the August meteors, and a faint continuous spectrum of green, blue, and indigo in the November ones. Secchi has also seen the magnesium lines.

In speaking of the sun as yet I have only noticed the analysis of its full light, except in mentioning the sun spot and Prof. Young's experiment, but when the spectroscope and telescope are combined we are able to obtain much more intimate information. During the eclipse of 1851 it was proved that those celebrated red solar prominences really did belong to the sun, but their true nature was a mystery till in August, 1868, Capt. J. Herschel, Col. Tennant, M. M. Janssen and Rayet saw their spectra, in which they recognised the bright lines C, D, b, F, G of Fraunhofer's spectrum. Hence they concluded that the red prominences, or flames as they are often called, consist mainly of Hydrogen, with some Magnesium and Sodium vapours. This was no sooner settled than spectroscopists began to think whether the prominences might not be seen with a spectroscope even when the sun is not eclipsed. The reason why they cannot ordinarily be seen is because they are dim in comparison with the intense brightness of the sun's disk, and the illuminated air, and also are rendered quite invisible by the means used to lessen the brilliancy of the sun so that the eye can bear it. But, argued Lockyer, Huggins and others, since the prominences are gaseous, and have bright *line* spectra, if we get a powerful enough spectroscope, and focus a prominence on to the slit the bright light of the sun and air will be

dispersed into a *continuous* spectrum, and so reduced in intensity that the eye can bear it, while the light of the prominence will be broken up into only three or four lines, which will retain their intensity however much dispersion may be used. This notion was applied successfully by M. Janssen on the day after the eclipse of 1868, but before the news reached England Mr. Lockyer had obtained a like success.

A prominence spectrum, if the slit is so placed as just to touch the sun's edge with one end, and then stretch out the whole length of the prominence, has first of course a narrow ordinary solar spectrum, then comes a bright line spectrum of various gases, due to a layer of so called *promineuce matter*, which envelopes the sun all round. Prof. Young has seen in this sierra or chromosphere, as it is called, no less than 273 bright lines and has determined the presence of the following elements:

Sodium	Calcium	Sulphur
Iron	Cadmium	Cerium
Magnesium	Titanium	Strontium
Barium	Manganese	

And with somewhat less certainty

Zinc	Yttrium	Didymium
Erbium	Lanthanum	

He rather suspects that he has seen some lines of the spectra of

Oxygen	Nitrogen	Bromine

and one line that he attributes to either Iridium or Ruthenium.

Next in order comes the real prominence spectrum, which is not hard to interpret. In the lower parts of the prominences are seen short lines of sodium and magnesium. You remember, I dare say, that I said, that at a low pressure the third faint line of Magnesium disappears entirely. Well, just close to the chromosphere all three are seen, but a little higher the faint one disappears, and soon after that the other two lines and the two Sodium lines disappear, clearly proving the gradual reduction of pressure as the gases get farther from the sun. The long lines in the prominences are with one exception due to Hydrogen, and this exception is a puzzle still, for in all the charts of prominence spectra that I have seen it is marked (?). Here we get a convincing proof of increased pressure and temperature near the sun; the F and G lines of Hydrogen widen out at their base, and three magnesium lines are seen.

Now we have a very fair account to give of the sun entirely taken from the spectroscope. It is first some solid or liquid incandescent mass, in the centre, giving a continuous spectrum, and surrounded by an inner envelope of glowing vapour causing Fraunhofer's dark lines; outside this

is the sierra or chromosphere of prominence matter, from which are expelled the rose coloured prominences

However, prominences are not observed in that way now Just consider a little what I said about Wollaston's experiments. He used a slit to pass the light through, so that the narrow images of the slit of which the spectrum is composed should not overlap one another; but, suppose the beam of light he had to examine had already been very narrow, he would not have had to use a slit to make it narrower. These red prominences send out just such a narrow beam of light, and if a spectroscope of very high dispersive power be used, the slit may be opened wide so as to admit the whole prominence, and yet the different rays of light will be so widely separated that a perfect image of the prominence will be shewn for each line in the spectrum that was seen before. Thus at C, there will be a red image, at F a green one, at G and H blue and violet ones. In practice this plan has been found to answer so well that it has been applied by Respighi to observe prominences all round the sun. His researches have divided all prominences into *Eruptive* prominences and *Cloud* prominences. The former are masses of vapour darting out with inconceivable rapidity to heights varying from 20,000 to more than 100,000 miles. These shew sometimes the lines of Sodium, Magnesium and Iron to a considerable height. Cloud prominences shew only the Hydrogen lines and the line near D, and hang seldom more than 80,000 miles above the solar surface. Prof. Young has observed some violent motions in the prominences, in one case a large cloud 100,000 miles long by 40,000 miles thick was blown to fragments and thrown to a height of 207,000 miles in less than an hour.

There is one more interesting application of the Spectroscope in astronomy that I must speak of, and it is perhaps the most extraordinary of all the things it does. I mean its power of measuring movements of recession and approach.

Suppose you were standing by the sea shore, counting the waves that came along, and that ten passed you in each minute. Then that somebody came and moved you to meet the waves without your knowing it, so that twenty passed you in a minute; you would at once say that the waves were coming in faster and were shorter. Then suppose that instead of being moved to meet the waves you were moved in the direction in which they were going, *i.e*, away from them, you would say they were coming slower, or if you were moved away at the same speed that the waves came on, you would declare that they were standing quite still, always supposing you thought yourself still at the time. I will give another illustration of what I mean. One day last term I was running fast from the town towards the college gates when the bell was ringing; as I ran past the bell, the sound suddenly

seemed to drop a little; that is, as I was running towards the bell the sound waves were caused to hit rather faster against the drum of my ear than they would have done had I stood still; and as I ran past and began to run away from the bell, they suddenly began to strike more slowly against it, and so gave rise to a lower tone There is an experiment which anyone can try for himself at any time, and I should strongly recommend you to try it, for it is well worth doing. If you remember I said that light was composed of waves no less than sound, so arguing on this Doppler propounded a theory to explain coloured stars, by saying that red ones were going away from us and so their waves of white light hit slower against the eye than they should do and appeared red, and that blue ones were coming towards us and their waves came faster and therefore appeared blue But this, if you think for a moment, though plausible at first sight is sheer nonsense, for there are waves of all lengths in the spectrum, though those that are longer than red cannot be seen by the eye and only appear as heat, and those that are shorter than violet are equally invisible and only appear as chemical or actinic rays, *i.e.*:—rays which affect the photographer's plate; therefore if a star were going away the only effect would be, so to speak a move up, some rays at the red end would become invisible, and some at the violet would be added on, and the spectrum would be just the same as before, *except*, and here is the valuable thing to notice, except there were gaps in it before; these would be slightly moved out of their original places. For instance the D gap would be a little more towards the green of the spectrum.

Mr. Huggins when examining the spectrum of Sirius, and comparing it with that of Hydrogen, after great pains, at last succeeded in discovering that the Hydrogen lines were the least bit "jerked" out of their proper places, towards the red end, and by applying this principle he has been enabled to shew that Sirius is going away from us at the rate of twenty miles a second. Other stars have since been examined and some found to be approaching and others to be receding; thus Arcturus is approaching at the rate of fifty-five miles a second, Betelgeux is going away at about twenty-two miles per second.

This method has done more than measure the proper motions of the stars. In applying it to solar prominences it was found that the most extraordinary and violent motions of the Hydrogen composing these could be detected by it. In the sun spots swift up and down rushes of Hydrogen have been quite apparent, and solar cyclones have been seen, in which the wind has been moving at the immense rate of over a *hundred miles a second.*

With that the celestial teaching of the spectroscope that I have to notice this evening is finished, and it only remains to mention Mr. Norman Lockyer's last experiments. He has lately read a paper before the Royal Society in

which he sets forth a method for proving that all the elements are reduceable if not to one or two, at all events to a very few, by means of the spectroscope. He has made more than 100,000 observations and is still working steadily to the same end. I am sure I hope he will succeed.

I have to express my hearty thanks to Mr. Rodwell for lending me the Sciopticon and slides we have seen this evening, and for his kindness in allowing me to use his books in preparing this paper. Also to Mr Mullins for the loan of some books without which it would have been more difficult if not impossible for me to have spoken so fully as I have done about Nebulae, Comets and Meteors.

There were 42 persons present; 2 Hon. Members; 18 Members; and 22 Visitors.

MEETING HELD MARCH 6TH, 1879.

The following donations, &c., were exhibited:—

Badge of the Odd-Fellows Society (now replaced by one of a new pattern), and

Curious fragment of Ancient Pottery, presented by Mr. Chivers.

Large collection of Fossils, presented by G White-Cooper, Esq., O.M.

Various Coins, presented by F. E. Corbett, H. A. Hartley, E. Gabbett, A. P. Glyn, H. P. Highton, M. S. Prichard, C. H. Hooper, R. S. Mansel, Esq.

Gosse on the Miscroscope, presented by E. S. Paine.

Local Bank Note for £1 1s., presented by Mr. Perkins.

A stamp album, and about 650 stamps, presented by the President.

A specimen of Hippocampus, lent by Mr. Hawkins.

The President then made a few remarks on the collection of coins belonging to the Society.

There were 37 persons present; 2 Hon. Members; 17 Members; and 18 Visitors.

MEETING HELD MARCH 20TH, 1879.

The following exhibitions were made:—

A fasciated branch of Ash, presented by Dr. Fergus.

An old Watch, date 1626, lent by Mr. Pope.

The first eggs of the Long-eared Owl (4), of the Brown Owl (8), and of the Rook, exhibited by N. Masterman, Esq.

A set of Shells from the Canal, collected by N. Masterman, Esq.

T. O. HARDING, Esq., then gave a lecture on a Calculating Machine.

There were 54 persons present; 8 Hon. Members; 22 Members; and 24 Visitors.

The meeting fixed for April 3rd was not held.

PRELIMINARY MEETING HELD MAY 8TH, 1879.

Meetings were fixed for Thursdays, May 22nd, June 5th, June 19th, July 3rd, and July 17th.

General Field-days on Saturdays, May 31st, and June 28th.

Minor Field-days on other Saturdays, provided the weather be fine, and a party can be formed.

There were 1 Hon. Member, and 24 Members present.

MEETING HELD MAY 15TH, 1879.

G. F. RODWELL, Esq, read a paper on Volcanic Products, illustrated by numerous specimens.

The following is an abstract: Volcano defined as any orifice in the earth from which are ejected materials affording either direct or indirect evidence of the internal heat of the earth.

Volcanos divided into (1) Extinct; (2) Dormant; (3) Active; (4) Mud Volcanoes; (5) Air Volcanoes; (6) *Fumeroli*, *Soffioni*, *Solfatare*, and *Mofette*; (7) Thermal Springs, including Geysers and Lagos.

Products—Solid, liquid, and gaseous. Lavas—Similarity of lavas from different vents. Bunsen's division of lavas into Normal Trachytic, and Normal Pyroxenic. Constituents of lavas.

Of the Elements, 12 non-metals, and 19 metals have been found in Volcanic products.

Vesuvius is the fertile source of Volcanic products, but the Island of Volcano, one of the Lipari group, has furnished some of the rarest and most complex of Volcanic minerals; among these one which contains seven non-metals, and six metals.

The principal volcanic minerals were then discussed and the competition and localities described.

Earlier in the week, a model of the Giant's Causeway had been exhibited and described; and allusion was made to the Basaltic Pillars, the lecturer declaring that at the *true* Causeway, the basalt was so light that a joint of one of the pillars could be carried easily, the basalt being in fact, lighter than wood. This statement was generally discredited.

There were 51 persons present: 2 Hon. Members; 21 Members; and 28 Visitors.

MEETING HELD JUNE 5TH, 1879.

A valuable donation of 6 assegais; fine specimens of the Horns of the Eland, Bonte Buck, Spring Buck, Grey Buck, Haarte Beest, and Blesbock; and a large collection of Lizards, Snakes, &c., from A. B. Van der Byl, Esq. (O.M.) was exhibited, and thanks ordered to be given to the donor.

N. MASTERMAN, Esq., then read a paper on Shells.

After the paper, a specimen of Egg Tray was exhibited by the President, and H. Richards, Esq., presented some shells from Bombay, also

Brick with Cuneiform writing,

Branch from the Tree of Knowledge of Good and Evil, and a plant of the "Rose of Jericho." (*Hierochuntina anastatica*).

There were 43 persons present; 5 Hon. Members; 22 Members; 16 Visitors.

MEETING HELD JUNE 19TH, 1879.

The following donations were announced:—

Moths from P. H. Maddock.

An old work on "Distillation," by Mr. J. Neate.

Report of the Winchester Society, by the Society.

Journal of the Meteorological Society, by the Society.

A cheque for £4, by Mrs. Booth.

N. MASTERMAN exhibited a bottle of leeches, pointing out their peculiar mode of progression, and their singular powers of abstaining from food, a good feed once a year being generally sufficient. Also some Land Shells, exhibiting a great variety of colouring, even in the same species.

The list of notices, considering the state of the weather, was very satisfactory, many species both of flowers and insects being obtained first by Members of the School, instead of Masters, as in ordinary years.

H. M. ELDER then read a paper on the

JAPANESE MIRROR,

AMONG the scanty furniture of a Japanese house, the traveller in Japan is invariably struck by the prominence given to those well-known bronze mirrors about which scientific men have lately been interested. Their appearance alone is somewhat curious, but their constant repetition is still more remarkable. They are round, varying from three to twelve inches in diameter, and have a flat handle, covered with a straw or split cane network. The back is ornamented with figures of animals, birds, or flowers, or some scene in Japanese mythical history, and there are generally some Chinese characters meaning long-life, happiness, or something else of the sort. The face is just like any ordinary slightly convex metallic mirror, but the convexity is so very slight that there is no apparent distortion of a reflected image. The fact that has lately brought them so prominently into notice is a peculiar property possessed by some two or three per cent. of, so to speak, reflecting their *backs*.

The place held by the ordinary mirror, whether it is magic or not, in the estimation of the Japanese, is very puzzling at first sight; it is found in every household, and one would have thought that this invariable recurrence might be accounted for by the elaborate head dresses of the Japanese ladies. But this is not the case, for I am told that they are never used by ladies to dress their hair by, and moreover in the Imperial palace, where the ladies in simple ancient fashion merely comb back their long hair, the mirror receives the highest respect. It is met with in the temples, in the hands of the street conjuror, in pictures of the infernal regions, and in the regalia of the Japanese sovereigns. In fact his mirror is one of the household gods of the Japanese; it is part of the Japanese religion; it is mixed up with the divine right of kings; it is the most precious of the possessions of a Japanese woman; it is the most important part of the bride's *trousseau*; and the Japanese look upon the two great Divine Palaces at Isé, where the first made mirror is deposited, much as the Greeks and Armenians do the Holy Sepulchre, or the Mahommedans Mecca.

The sanctity of the mirror was very well expressed by a friend of mine who has visited Japan, and who has helped me considerably in preparing this paper; when I was talking to him about it some few weeks ago, I remarked that I supposed the Japanese worshipped his mirror as one of his household gods; "Oh no," was the answer, "they don't worship it, they reverence it." In fact I may say the Japanese feels with regard to his mirror, much as the Christian does with regard to the Cross.

There are two principal religions in Japan, Buddhism and Sintooism; for the Japanese have the most extended notions of religious toleration, in

spite of what I have often heard to the contrary. Buddhism was, I suppose, imported from Hindustan by way of China, possibly by those Chinese, who according to Captain Sherard Osborne, colonized Japan about 300 B.C. However, whether Buddhism was carried into Japan by these immigrants or not, their leader, Sinfuh or Sinto, was the founder of the so called ancient religion of Japan, Sintooism. This is really, if analysed, merely fire or sun worship, and according to Encyclopaedia Britannica is of Babylonian origin, though how the male deity of the fire worshipper got changed into the female Sun-goddess, *Ten-sio-dai-sin* of the Japanese, it does not even hint.

The connection of the mirror with this worship is shewn in the myth of the first mirror, which tells us that *Ten-sio-dai-sin* in a rage shut herself up in a cave and refused to come out; the other inferior gods or *Kami*, through whom only, by the way, can the superior goddess be approached, were in despair at their lady's sulkiness, and the darkness caused by it, and tried all manner of artifices without success; till at last one of them, more ingenious than the rest, whose name I have been unable to discover, invented the mirror. This observing deity had not counted in vain on female vanity and curiosity. In great jealousy at seeing as she thought anyone so beautiful as herself, the goddess came out, and restored light to the earth. Afterwards in creating the Japanese Empire, she handed this mirror, which is now among the Imperial regalia, to her grandson with these words:—"Look upon this mirror as my spirit, keep it in the same house and on the same floor with yourself, and worship it as if you were worshipping my actual presence."

The mirror is now the emblem of purity of soul, for the Japanese are as particular about ceremonial purity and uncleanness as were the Jews. Contact with a dead body, eating of any animal but a deer, and many other equally trivial matters, render the Japanese ceremonially impure. Even after eating the flesh of a bird or fish he is impure for the space of two hours.

So much for Japanese mirrors in general. Now to speak of their so called magic properties. Though the Japanese themselves seem extraordinarily ignorant of these, insomuch that *magic* mirrors are never exposed for sale, they were well known to the Chinese from the earliest times, and one of their writers described them as early as the Ninth Century of the Christian Era. They were known as *theou-kooang-kién*, or mirrors which let the light pass through them, a name evidently arising from a popular error. The Roman writer Aulus Gellius, who lived 17 centuries ago, described mirrors that sometimes reflected their backs and sometimes did not. Herr Sterne thinks it probable that the mirrors with figures of goblins and imps on the back, which formed part of the stock-in-trade of a mediaeval witch

were of Japanese manufacture. But curiously enough it is found that Japanese literature makes absolutely no mention of them at all.

Magic Mirrors seem to be of two kinds, first those which so to speak *reflect their backs*, by which I mean that when a beam of light is reflected off them on to a screen, an image of the back is seen there, instead of the ordinary round bright spot that one would expect. Secondly, those which when looked at straight, or even when light is reflected off them, shew no pattern, but when looked at *obliquely* shew a design, often a portrait of a Japanese saint, which has *no connection whatsoever* with the pattern on the back of the mirror. Of this last kind of mirror there do not seem to be very many extant, though Japanese literature is not silent about them as about the more ordinary form. In the *Shim-pen-kamakura-shi* or "New Collection of Writings about Kamakura," it is mentioned that in the temple *Kenchoji* in the ancient capital of the *Shogun*, *Zio-Goon* or *Tychoon*, the military Emperor of Japan, there is treasured up an old mirror 3½ *sūns* high, and three *sūns* wide, which when looked at obliquely shows the image of a Buddhist god. The *Kuge Rokujo*, an officer of the *Mikado's* court at *Kioto* formerly possessed a mirror of this sort, in the face of which could be distinguished a portrait of the famous priest *Shinran sho-nin* the founder of the *Shinshiu* religion to which the *Honguanji* temples at *Kioto* belong. The way in which this effect is produced, is said to be the same as that described in the *Kokonito*, "or Genealogy of the Old and New Physicians," which is as follows:—Take ten parts of *shio* (gamboge), one of *funso*, and one of *hosha* (borax). Powder these well and mix them to a paste with some dilute glue. Then if any pattern be drawn on the *face* of a mirror with this and be allowed to dry, after polishing it, it will be seen on looking at the mirror obliquely. A certain Tokio mirror maker uses the chemical method of affecting a mirror surface to cause the anomalous appearance in the reflected image, as he says, but when put to the proof it turns out that his method does not have the desired effect. He describes his process thus:—coat the surface of the mirror except the portion that it is desired shall appear bright, with *urushi* (Japanese varnish) then act on the remaining part with a paste composed of equal parts of sulphur and copper sulphate, mixed with *shiro-umedsu* (white plum acid). If this paste after being allowed to dry on the mirror, which takes about two days, be rubbed off and the mirror well polished, the pattern will become invisible when looked at, but will appear in the reflection of the mirror thrown on to a screen. Professor Ayrton on hearing this ordered him to make a mirror after a pattern of his own in this way, but the result proved a failure, for after many polishings the design disappeared altogether both for direct vision and reflection.

The first and more celebrated kind of mirror, the one on which the reflected image of the back is seen, apparently is entirely unmentioned in Japanese literature, either in respect of its phenomena or manufacture. The Chinese are not so silent, *Chin-kouo* a Chinese writer who flourished about the eleventh century speaks with admiration of it in his memoirs called *Mong-ki-pi-tan*. The poet *Kin-ma* has celebrated it in verse, but till the time of the Mongol emperors no one attempted to explain its phenomena. *Ou-tseu-hing* who lived between 1260 and 1341 was the first to attempt to throw any scientific light on the subject. I will quote his words. He says :— "When we turn one of the mirrors with its face to the sun, and allow it to throw a reflection on a wall close by, we see the ornaments or the characters which exist in relief on the back appear clearly. Now the cause of this phenomenon arises from the employment of two kinds of copper of unequal density. If on the back of the mirror a dragon has been produced while casting it in the mould, then an exactly similar dragon is deeply engraved on the face of the disk. Afterwards the deep chisel cuts are filled up with denser copper, which is incorporated with the body of the mirror, which ought to be of finer copper, by subjecting the whole to the action of fire, then the face is planed and prepared, and a thin layer of lead or tin spread over it. When a beam of sunlight is allowed to fall on a polished mirror prepared in this way, and the image is reflected on a wall, bright and dark tints are distinctly seen, the former produced by the purer copper, and the latter by the parts in which the denser copper is inlaid."

If then this description has been translated correctly, *Ou-tsen-hing* saw the pattern dark on a bright ground instead of bright on a darker ground, as is seen now in Japanese mirrors.

He adds further on that he has seen a mirror broken in pieces and thus ascertained for himself the truth of this explanation. But as we shall see further on he was mistaken.

Sir David Brewster in 1832, advanced an explanation of the phenomenon in a paper in the *Philosophical Magazine*. He and Sir Charles Wheatstone were both under the impression that it was caused by a trick of the maker. Sir David Brewster says :—"Like all other conjurors, the artist has contrived to make the observer deceive himself. The stamped figures on the back of the mirror are used for this purpose. The spectrum in the luminous area is *not an image of the figures on the back*. The figures are a copy of the picture which the artist *has drawn on the face of the mirror* and so concealed by polishing that it is invisible in ordinary lights, and can be brought out only in the sun's rays."

Professor Atkinson, of the Tokio Imperial University, seems to have been the first to experiment carefully on the subject, and to approach to the true

explanation. He wrote to *Nature* in May, 1877, as follows:—"I have been unable to find a satisfactory explanation of this fact, but on considering the mode of manufacture I was led to suppose that the pressure to which the mirror was subjected during polishing, and which is greatest on the parts in relief, was concerned in the production of the figures. On putting this to the test by rubbing the back of the mirror with a blunt pointed instrument, and permitting the rays of the sun to be reflected from the front surface, a bright line appeared in the image corresponding to the position of the part rubbed. This experiment is quite easy to repeat, a scratch with a knife, or with any other hard body is sufficient. It would seem as if the pressure upon the back during polishing caused some change in the reflecting surface corresponding to the raised parts, whereby the amount of light reflected was greater; or supposing that, of the light which falls on the surface, a part is absorbed and the rest reflected, those parts corresponding to the raised portions on the back are altered by the pressure in such a way that less is absorbed and therefore a bright image appears." However, Professor Atkinson adds that this is not to be taken as an explanation of the phenomenon.

Mr. Prinsep, in the 'Journal of the Asiatic Society of Bengal,' in 1832, put forward a theory, which though based on wrong principles was an approach towards the truth. He was under the impression that the design on Japanese mirrors was stamped, and thought that the thinner parts of the mirror were slightly more convex than the thicker. He accounted for this by saying that the stamped part would be harder and more compact than the rest and therefore would be less worn away than the thicker and softer part by polishing. But unluckily for Mr. Prinsep's theory Japanese mirrors are all cast and *never* stamped.

Some years ago, an English brass worker, whose name I am sorry to say I do not know, after seeing some experiments with a magic mirror by Professor Pepper at the Polytechnic, most praiseworthily attempted to solve the problem. He too was under the impression that the mirrors were stamped, and found that, "Taking ordinary brass and stamping upon its surface with any suitable die, not once, but three times in succession on the same spot exactly, grinding down and polishing between each act of stamping, a molecular difference was established between the stamped and unstamped parts, so that the images of the pattern could be reflected from the finally polished surface, just as with the Japanese specula, though no difference of surface could be detected with the eye."

At first sight this idea of stamping seems very plausible, for Sir David Brewster in his "Letters on Natural Magic," describes a method for deciphering inscriptions on old coins that have been worn smooth by use, which

depends entirely on the molecular difference caused by stamping between the parts subjected to greater and less pressure. But no explanation which depends on stamping will do, because casting and not stamping is the method used in making the mirrors.

Professors Ayrton and Perry, to whom the true explanation of these magic phenomena is due, divide the possible explanations into three classes.

1.—The pattern might be scratched on the face of the mirror and hidden by subsequent polishing. But on careful examination under a microscope not a trace of such pattern can be discovered.

2.—The molecular constitution of that portion of the face that casts the brighter reflection might differ from that of the metal forming the rest of the mirror, and this might produce the given results in three ways.

a.–By causing the portion of the face corresponding with the pattern on the back to attract more mercury and so become capable of being polished more easily.

b.—By causing it to be harder and so acquire a higher polish.

c.—By causing it to polarize light.

3.—The face of the mirror might have intentional or accidental irregularities of surface, in consequence of which the part corresponding with the pattern on the back might be relatively concave and so concentrate the light or at any rate might disperse it less than the remainder of the slightly convex mirror.

Professors Ayrton and Perry proved among their first experiments that the phenomenon was not due to polarized light, and found in the end that the third of these possible causes was the real one.

To make this clear I must try and show you a little about the reflection of light.

Suppose you have a ray of light coming from the sun and striking upon a piece of flat polished tin or silver, the light cannot pass through this, and is turned or reflected back straight along the line it came, just in the same way as if you knock a billiard ball straight against the cushion of a billiard table it rebounds or is reflected back along the line you sent it. If, however, you send the ball slantways against the cushion it is sent back slantways, only slanting in the opposite direction. In the same way with light, if your pencil of light strikes slantingly on the polished tin surface it is reflected back slantingly, making the same angle with the surface as before, but in the opposite direction. This is expressed by saying that the *angle of Incidence is equal to the angle of Reflection*. Now suppose you bend your piece of tin slightly, then the ray of light will make different angles with the surface on each side of the bend, and it will be reflected part in one direction and part in another. If it is bent so

that the angle opens away from the source of light, the two fresh directions will go away from each other. Now suppose you have a surface made up of a very great many very small pieces of metal very slightly bent indeed, but so that the whole surface of the reflector is raised or convex towards the source of light Then each little piece of metal will reflect light in a slightly different direction to the piece by its side, and the whole reflector will somewhat spread out the light that is reflected from it instead of, as a flat surface would, sending back a pencil of rays equal to the incident one, in section. That is to say you will have a piece of a cone of rays coming from your mirror instead of a cylinder. But this will not be the only effect. For suppose a given amount of light is reflected from a flat mirror, the reflection will be of a given brightness, but if the mirror is convex, though the same amount of light may be reflected, it will be spread out over a larger space, and will be less intense the larger the space is.

Now suppose you have a convex mirror, but that in some parts of it the curve changes and the surface is slightly flattened ; then the light that falls on these flattened parts will not be spread out quite so much as that falling on the rest of the mirror, and therefore in the reflection the given amount of light falling on a small piece of the mirror will be condensed into a smaller space by the flat parts than the round, and those parts will show up brighter in the reflected image, while just round them where the curve of the mirror changes there will be a small space where the curvature is rather greater than usual and the rays there will be more spread out, so that there will be a slightly darker space round the bright, which will not be noticed, truly, but will help by contrast in making the bright parts look brighter than they otherwise would.

Profs. Ayrton and Perry had some suspicion that this might be the cause of the phenomenon seen in their mirrors and so they set themselves to prove it. They argued thus :—Ordinary rays of light are either *parallel*, or nearly so, like sunlight ; or, like the rays from a candle, or the lime or electric light *divergent*; that is, as they go away from the light they separate from one another. For instance if you fix your attention on two rays which at a foot from your lime light are an inch apart, at two feet they will be two inches apart, at 3 feet three inches, and so on. But suppose they could be made to be convergent, that is to approach each other so that eventually if nothing is in the way they will come together to a point, and a mirror put in the way, exactly the reverse phenomena should be seen ; that is the parts which were bright before should appear dark now, and *vice versa*. I will try and explain how this is. Suppose you have two rays approaching each other and falling on the surface of an ordinary convex mirror. The mirror, aswith parallel or divergent rays, tries to set these going away from each other, but if they are

approaching pretty decidedly it simply makes them approach rather slower than before, for it has not curvature enough to set them going away again. Now suppose these two rays strike on the flattened part of the mirror; this does not tend to send them away from one another and they go on and meet soon after touching the mirror. The others do the same but do not meet so near the mirror and are less inclined to one another. Then, since those which fell on the curved surface did not approach each other or converge so fast as those which fell on the flattened surface, they will not diverge from one another so fast after passing the point of meeting; and it will happen that if you put a screen *between* the mirror and the points of meeting of your convergent rays the ordinary phenomenon will be seen, but if you put it *beyond* this point of meeting where the rays have become divergent, the rays which fell on the flattened parts of the mirror will be scattered most and the result will be a *dark* pattern on a brighter ground instead of a bright pattern on a darker ground. When this experiment was tried by converging the sun's rays by a lens on to the mirror, the result was as they expected, the pattern came out plainly, dark on the brighter background. Here then was a convincing proof that the phenomenon of a Japanese mirror is caused by an inequality of curvature in the surface.

But there was another proof that could be adduced. If you remember what I said about divergent rays just now, and the way the bright image of the mirror is formed, you will see that if the screen be held very close to the mirror, the rays that are reflected from the curved parts will not have room to diverge sensibly and therefore will diverge so little more than the rays reflected from the flattened parts that there will bo no sensible difference in the brightness of the images of the curved or flat portions of the surface, and the phenomenon will not be seen. While if the image is due to some intrinsic difference of the reflecting power of the parts of the mirror it will not be affected whether the screen is close at hand or far off. As a matter of fact, if the experiment be tried the bright line image is seen totally to disappear when the screen is held very close to the reflecting surface of the mirror.

I think then that this sets it beyond a doubt that the phenomenon is due to a slight difference in the curvature of the various parts of the mirror, *i.e.*: that the thinner parts of the mirror are slightly less convex than the thicker. It remains to show how this is brought about. To do this we will see how the mirrors are made.

All Japanese mirrors are cast in moulds, the pattern is never given to them by stamping. The quality of a mirror depends on the alloys of which it is made and the perfectness with which the pattern is executed on the back. The moulds for casting mirrors in are made in two halves, each half being perfectly flat, though as you can see by the help of a straight edge all Japanese

mirrors are more or less convex. The material for making mirror moulds is a kind of clay, found near Tokio and Osaka, mixed with water and strawash. This is made into two suitable slabs and a half liquid mixture of powdered old crucibles or a fine powder called *to-no-ko* is spread on them. On one of these then, the artist cuts the design for the back of his mirror with a hand tool, or sometimes stamps it with a block of wood cut in relief. A rim of the thickness that the mirror is to be is set round one half of the mould, and the two halves are put together. Then the molten metal is run in, and when cold the moulds are broken and the cast mirror taken out. The best quality mirrors are made of an alloy containing

Copper	75.2	per cent.
Tin	22.6	„
Iyo Shirome	2.2	„

Inferior mirrors have more copper, and sometimes have *Tori shirome* substituted for *Iyo Shirome*. *Shirome* is a name give to a natural sulphide of lead and antimony found in the island *Shikoku*. The best is called *Iyo Shirome* because it comes from the province of *Iyo*. *Tori Shirome* has an admixture of copper. Lead or zinc in some form is required to form the mirror or else it would become too brittle, and as metallic lead or zinc comes to the surface in casting and prevents it from taking the amalgam well the Japanese makers have substituted *Shirome*.

Mirrors cast in a mould in which the design has been made by hand, are called *ichi-mai-buki*, 'mould used once,' and are regarded as artists' proofs. To form other moulds these mirrors are pressed on the wet clay, so as to transfer the pattern. But when mirrors are cast in such moulds the design on their backs is not so clear as on an *ichi-mai-buki* mirror.

After casting the mirror is quite flat, and even if it were not it would be rendered so by the next process, which consists in scraping the surface with a hand-scraping tool. So that it is evidently false to imagine the convexity is given in the casting. The way it really is produced is most curious. I will quote Prof. Ayrton's description of the process. "The mirror is placed face uppermost flat on a wooden board and then scraped or rather scratched with a rounded iron rod about half an inch in diameter and a foot long, called a *megebo*, 'distorting rod,' so that a series of parallel scratches is produced, which causes the face of the mirror to become convex in the direction at right angles to the scratches. This effect is very clearly seen by applying a straight edge in different ways to the face of an unpolished mirror which has received a single set of scratches only. A series of scratches is next made with the *megebo* in a direction at right angles to the former, a third set intermediate between the two former, and so on, the mirror each time becoming slightly cylindrical, the axis of the cylinder in each case being parallel to the line of

scratches, so that eventually the mirror becomes generally convex. Some workmen prefer to make the scratches with the *megebo* in the form of small spirals, others in the form of large spirals, but the general principle of the method employed with their mirrors seems to be always the same; the face of the mirror is scratched with a blunted piece of iron, and becomes slightly convex, the back, therefore becoming concave."

After this operation the mirror is very slightly scraped with the hand scraping tool to make the surface smooth for subsequent polishing.

During the operation of scratching with the *megebo* the face of the mirror is visibly concave, why then should it become convex? Apparently it receives a kind of 'buckle' from the rod and springs back after the pressure of the rod is removed. If so it is evident how it is that the parts which come out bright in the reflection become flatter than the rest of the mirror. They are the places where the bronze is thick from the pattern at the back being raised; this thicker bronze will not yield so readily as the thinner, to the *megebo*, and therefore does not buckle back so readily and is left somewhat flat or possibly even concave.

If the mirror is very thick the use of the *megebo* alone will not make it convex, so the maker cuts it convex with a knife. During the process it is applied to a concave hard clay pattern, and if the maker finds that he has cut away too much in any part he rubs this round and round with the *megebo* until the bronze by buckling back has regained the necessary degree of convexity.

Hence we see the explanation of that experiment of Prof. Atkinson's that I mentioned. The scratch on the back of the mirror would buckle back and cause a convexity on the back and therefore a concavity on the face, and this as I have shewn would cause a bright line in the image.

After the use of the *megebo* the mirror still remains red and unpolished. This is rather an elaborate process. First a whet stone called either *Iyodo*, whet stone from the province of *Iyo*, or *Shirote*, white whet stone, is used, then after that another whetstone called *Tenshimado*, whetstone from the province *Tenshima*, or the powder *to-no-ko* which I mentioned in connection with the mirror moulds, is used. Thirdly a piece of charcoal is rubbed over the face. By now this is fairly smooth, but it generally contains some few cavities, these are filled up from a stock of copper balls that the maker keeps, and well rubbed so as to hide the join. These bits of copper probably led *Ou-tseu-hing* into his mistake in the 13th century.

When the face is quite smooth an amalgam which the Tokio makers, make of equal parts of mercury and tin is rubbed over the surface with a stiff straw brush or with the hand. Finally it is wiped clean with a soft kind of paper called *Mino-gami*, paper from the province *Mino*, which is supposed to scratch

and Moths to one thousand, at present we can number the respectable total the surface less than silk. Leather is never used in polishing, for it would be considered impious to pollute so holy a thing as a mirror by touching it with the skin of an animal.

So we see that the magic property of the Japanese mirror is really due more to an accident than to any conjuring-trick or design on the part of the maker, and owes its existence to that property which thin bronze has of buckling back under a certain bending stress and remaining bent after the stress has been removed.

In conclusion I must thank Mr. Rodwell, for the kind aid he always so readily gives me, both by his advice and by allowing me to use his books, and Lowder for the valuable information he has given me about some customs of the Japanese.

Illustrated by two specimens, one lent by the President, the other by G. F. Rodwell, Esq.

There were 71 persons present; 5 Hon. Members; 28 Members; 38 Visitors.

MEETING HELD JUNE 26TH, 1879.

This was an extra meeting, when N. MANDERS, Esq., read a very interesting paper on the

ENTOMOLOGY OF MARLBOROUGH.

As our list of insects (*Lepidoptera*) is now fairly as full as we can hope to make it; and as this is probably the last time I shall be connected with it to any great extent, I thought it would not be amiss to write a few notes on the most interesting insects in the list as well as a few remarks on the locality generally. The Lepidoptera of the Forest and of the Vale of the Kennett as far as Chilton, including the large woods on either side, are fairly well known: the country North of Marlborough, being a stretch of barren down, is not worth the trouble of much search, though for the archæologist it is rich in ancient graves and monuments; what is known of Stype and Bedwyn promise many novelties thence, but as they are at some distance from Marlborough a systematic investigation of them is at present impossible.

The locality best suited for an entomologist on account of the number and variety of its insects is undoubtedly Rabley Copse, this is on account of its varied vegetation and thick undergrowth; the worst locality, contrary to

general expectation, is the Forest, there are fewer insects to be found there than in any wood I know; though perhaps in horse-flies it can more than hold its own with other woods, but they are game not usually hunted for by collectors; a few insects are peculiar to it, as *Leucania turca*, *Demas coryli*, *Eupithecia irriguata*, but on the whole it is disappointing. The West Woods occupy a large extent of country, and are an excellent hunting ground. During the sunny days of March, *Brephos notha* flies wildly amongst the birch trees, and requires a good pair of legs to catch it; at the same season of the year *Tortricodes hyemana* flies merrily about the oak scrub; and later on, in July, the beautiful *Phorodesma bajularia* comes to light, and *Cymatophora or* and many others to sugar; amongst the heath *Lasiocampa rubi* has been found, but is now apparently extinct, whilst the smaller *Fritillaries* and commoner moths abound everywhere; this wood has also insects peculiar to it, namely, *Scotosia undulata* (the only one ever caught near Marlborough); *Cymatophora or* and *Epunda Viminalis*. Perhaps when the other woods are still more fully searched, this may be found not to be the case, but at present we must take the facts as they stand. The small remnant of Manton Copse, lying between the West Woods and the Forest, is the only locality for the rare and beautiful *Cymatophora ridens*, which may be obtained as larvæ in June on the oaks; and on the oak trunks the cases of *Psyche roboricolella*.

Turning our attention to the other side of the country; Bedwyn is undoubtedly an excellent locality, but as I have said, has not been much investigated; however, it has had the honour of presenting us with one insect, *Toxocampa pastinum*, which has been found nowhere else near Marlborough, and also the *Glanvill* and *Likeness Fritillaries*, but these are now extinct. Stype, situated on very high ground, yet swampy, and covered with oak trees, is the domain of the Purple Emperor, White Admirals too, make this one of the most enticing places for butterfly hunters, besides the beauty of the spot itself makes it a most desirable place for lovers of the beautiful. So much for the localities.

As regards the insects themselves, some, it is well known, are extremely local, and others are common everywhere; some only inhabit woods, others again only inhabit pasture lands and down, but this is common to all localities. A few facts perhaps worthy of notice I have observed during my brief experience: one is, the total extinction of some species and the comparative commonness of others at one time unknown. I refer to the disappearance of the Greasy Fritillary (*Melitæa artemis*) and the Wood White (*Leucophasia sinapis*) and the occurrence of the White Admiral (*Limenitis Sibilla*), *Thecla W. album*, and *Arge galathea*. *M. artemis* was certainly common in the West Woods, at Chisledon, and near the Forest; and *L. sinapis* in

Rabley Copse. I can find no date of the occurrence of the former in the Natural History reports, or otherwise later than Midsummer, 1868, and *L. sinapis* seems to have become extinct about the same time.

The first note we have of the occurrence of *Limenitis Sibilla* is in Midsummer, 1868, at Ramsbury, and of *Thecla W. album* in 1873, found commonly at Littlecote, and one, evidently a straggler, in the Fir Avenue, Savernake Forest. In 1874, all three species were found commonly at Stype, from thence they are apparently spreading their range westwards; *Lymenitis Sibilla* was captured last year at the Ruins, *A. galathea* near the Hospital, *Thecla W. album* on the Forest hill, and this year on the railway line west of the town. I do not wish to strain the point too far, but it is interesting that while some insects for no apparent reason have become extinct, others, before unknown, are gradually occupying the localities formerly occupied by them. It will be interesting to observe whether these three insects will gradually spread onwards towards the West Woods. Another thing worthy of notice is that though Marlborough has a vast insect fauna, anything like an abundance of one species is not known here: this is, I believe, on account of the enormous multitude of different kinds that have to struggle for existence, often in a limited space, so that there is no room for many of one species; the number of species decreasing the number of specimens.

Turning then to the last complete list, 1877,—the butterflies are well represented by fifty species which is a large number for one locality. The *Sphingina* and *Bombycina* contain several interesting rarities, as *Deilephila livornica*, *Chærocampa celerio*, *Stauropus fagi*, and *Leiocampa dictæoides*, probably several more species will be added to the *Bombycina*. The *Noctuina* would no doubt be still further increased by careful sugaring. Some attempt at it has been done during the last season, and half-a-dozen species new to the list was the result.

By means of light also many good insects have been taken; to those unable to go out during the night, it will be found well worth their while to visit the gas lamps in the morning just before sunrise: by going thus regularly, many rare insects have been taken in Marlborough, perhaps the best moth I ever took (*Camptogramma fluviata*) was in this way. Within the last few years the idea has occurred to entomologists to take the light to the moths, *i.e.*, into the woods; the apparatus is simply a glass case with perforated zinc top made to hold three paraffin lamps, this is hoisted on four poles, one at each corner, and the thing is complete, it certainly has the disadvantage of keeping one out late at night as moths do not come to light in any abundance till eleven o'clock, and then keep coming in varying numbers until day-break. One species, *Myelois cirrigerella*, new to Britain,

was taken by means of "light" at Ramsbury; the great uncertainty of "light" is shown in the fact that three specimens of the above were taken in one night and though it was systematically "lighted" for during the remainder of that year and the whole of the next, no other specimen was taken and the insect has not been seen in Britain since. The list of *Geometridæ* is as complete as we can hope to make it, exception might perhaps be made to the genus *Eupithecia* which may be increased by breeding. We are indebted almost entirely to E. Meyrick, Esq., for the excellent list of *Micros*; it contains, besides one new to Brltain, others of extreme rarity; the list of *Micros* was only started in 1872, and it is in them that new species are likely to occur, though unfortunately it is hard to find anyone who takes an interest in them. Collecting *Micros* is extremely simple, nothing but the beating stick and the usual net and pill boxes, or better still, glass topped boxes, being required; they certalnly require close search as many are very local, swarming on one bush and on another close by not one will be found; some have their ewn especial favourite plant or flower, usually the food plant, amongst which they may generally be found, as the scarce *Argyrolepia cnicana* amongst thistles at Rabley, and *Anesychia decemguttella* amongst the *Lithospermum*. Others are unfortunately only too common everywhere, the *larvæ* of *Tortrix viridana* frequently strip the oaks of their foliage, and a few years ago all the larch forests in the Upper Engadine were entirely stripped of their leaves on account of the myriads of the *larvæ* of a *Tortrix* which infested them. It was feared that the trees would be destroyed on account of their depredations, but fortunately the larva died from their food failing, so that the next year scarcely a moth was to be seen. It will be seen from this that though so small, the *Micros* play an important part in the economy of nature and should by no means be neglected because they are of small size.

A few more comments than ordinary are required on the list of insects observed this year; a very cold winter was followed by as wet a spring and summer as perhaps many of us can remember, and though this delayed the appearance of most insects, yet one, *Miselia oxyacanthæ*, was captured in June, its ordinary month being September! Several rarities have been taken more commonly than for some time past; it has been frequently noticed that rare insects have been found more abundantly in wet seasons than in dry, and it has been suggested that on account of the paucity of insects entomologists have had to look more diligently for them. In our own case I would suggest that it is because members of the Society have been much more energetic than for some years past. New species have been taken this year by members of the College, a feat not accomplished by them for four years. It is to be hoped that they will succeed in raising the number of Butterflies

of nine hundred and twenty species. Nearly all of these may be seen in either E. Meyrick's or my own cabinets.

It was followed by a very lively discussion.

There were 72 persons present; 2 Hon. Members; 22 Members; 48 Visitors.

MEETING HELD JULY 3RD, 1879.

The President announced that Miss Preston had offered a prize for the best paper read by a Member of the School below the VIth, at a meeting of the Society. It was hoped that this would induce members to try and do something more to make the meetings interesting.

He also exhibited a set of coins found near Newcastle in a well of the Temple of the Goddess Coventina, with a book containing a full description of the Temple and objects found there, presented by John Clayton, Esq.

H. RICHARDSON, Esq, gave a most interesting account of his visit to the Persian Gulf.

There were 71 persons present; 1 Hon. Member; 21 Members; and 49 Visitors.

MEETING HELD JULY 17TH, 1879.

The President placed in the Library a work by the Rev. G. Henslow, giving the details of the types of all the British Orders of Plants, and lithographed by himself.

Also, a bank note of the Southern States of America, and a token, presented by Mr. J. Velvin.

N. Manders, Esq., exhibited a box of moths captured by himself this season.

The President gave a short lecture on the Arm.

There was then an election of the Rev. J. P. Way to fill the place on the committee, by the departure of T. O. Harding, Esq., and of H. M. Elder, in the place of W. H. Chappel.

There were 39 persons present; 3 Hon. Members; 16 Members; and 20 Visitors.

CHRISTMAS TERM, 1879.

PRELIMINARY MEETING HELD SEPTEMBER 25TH, 1879.

Meetings were fixed for Thursday, Oct. 9th, 23rd; Nov. 6th, 20th, and December 4th.

The following donations were announced:—

Reports of the United States Geological Survey, by the United States Government.

Proceedings of the New Zealand Institute, by the Institute.

A collection of Chalk Fossils, by Rev. O. A. Elton.

There were 15 persons present, 1 hon. member and 14 members.

MEETING HELD OCTOBER 9TH, 1879.

H. M. ELDER read the following paper on

THE UTILIZATION OF WATER POWER.

FACTS are stubborn things; and all statistics on the subject at present point to the fact that after a certain period, perhaps not very long, our coal supplies will fail if the present wasteful abuse of them continues. Mr. Proctor has given some undeniable figures shewing this; and in fact it is not a difficult matter to get statistics proving that our coal supplies will come to an untimely end within the next two hundred years; some calculators even placing the limit as near as 1960, *i.e.*, eighty years hence. This would be a most disastrous thing for England as our whole, or almost our whole, national prosperty depends on our coal fields, since they give such facility in working iron, and afford steam power for other purposes. Every patriotic Briton therefore should at least take a great interest in this question of our coal supply, and the means by which it may be oked out for a much longer period than the two hundred years.

The thing needed is either heat or motion, for modern science is perfectly capable, if given one of these, by the intervention of certain agents to convert it into the other. For instance, given heat, then a steam engine

may convert this into motion; or, given motion, this may become heat by friction, or more conveniently by electricity. The savage who lights his fire by rubbing together two sticks shows this. At the present time we have a limited supply of heat in a most convenient form in coal, which we are using as if unlimited; we also have a practically unlimited supply of motion in the flow of rivers or tides, or the winds, which we scarcely use at all. My object now is to try and shew you how this supply may be economically utilised, and how a few men who see somewhat farther than others, are taking advantage of what nature has placed ready to their hand. I owe it to the kindness of Captain Aylmer, the owner of some large hydraulic works on the Rhone at Bellegarde, that I can exhibit this evening plans and photographs of these works, and so illustrate what I want to say.

The Rhone is a very fast river indeed and well adapted for moving machinery. By Geneva you constantly see the very simplest form of instrument for taking power from water, *i.e.*, an ordinary paddle wheel, like that of a steamer, let down into the water so that the water flowing against the paddles turns the wheel round. This is obviously a most wasteful form of machine and uses but a very small part of the power that is to be got out of the water. An *undershot wheel*, which is the same type, is far better. In this the paddles play in a sort of box canal so that all the water that passes must act upon them. By it fifty to sixty per cent. of the power is utilized. Another and perhaps better known type of wheel is the *overshot wheel*, which has no paddles but is surrounded with buckets which catch water that is conducted to them at the top, the full buckets out-weigh the empty ones on the opposite side of the wheel, and cause it to go round. These wheels utilize perhaps seventy-five per cent. of the power which the moving water is competent to supply, or work that it can perform.

The expression that I have just made use of makes it necessary to say a few words about the *Conservation of Energy*, as it is called. You cannot go into a shop and buy a number of things without paying their value or perhaps rather more than their value for them, of course supposing you are honest, which nature always is; nor can you get a certain amount of work done without expending its equivalent of power or rather more, to allow for loss by friction on transmission. The power acquired may be very different to that expended, just as a pennyworth of sweets is very different to the penny you gave for them; but still each is the acknowledged equivalent of the other. The force of gravity is the conveniently constant standard to which we refer all others, and it is done in this way. The raising of one pound through one foot is called the *unit of work*. So that to raise two pounds through one foot or one pound through two feet is two units of work, or to raise half a pound two feet is one unit of work. It has been estimated,

probably wrongly, but that does not matter, that a horse can perform 33,000 units of work per minute, *i.e.*, raise 33,000 lbs. one foot in one minute, and so a power that can effect this is called a horse power.

Now you will be able to see how water can perform work. If a body falls it can do work in falling, and obviously the amount of work is dependent on the weight of the body and the distance it falls through, thus one pound falling through one foot, not considering friction or other loss, could raise a pound through one foot, or a pound of water falling one foot, if made to do work would do one unit of work, and *A* pounds falling through *B* feet would do $A \times B$ units of work. One word more on this subject. Suppose you had a column of water, say seventy feet high, and of such thickness that one pound of water occupied one foot in the column. Now suppose you drew away from the bottom of this one pound of water; every pound in the column would fall through one foot; that is, seventy pounds would fall through one foot; and if the pound that was drawn off were made to do work it would do the work due to the fall of seventy pounds through one foot, or seventy units of work; that is, the amount of the work it would have performed in falling from the top to the bottom of the column. This, of course, is true of a column of any thickness.

Water wheels are by no means the only method of transforming the energy of falling water into energy that may be readily applied. Where a very great fall can be utilized a machine of the steam engine type is conveniently used, *i e.*: a piston working backwards and forwards in a cylinder and controlled by a D-valve or oscillating cylinder. The details of this, anyone who understands a steam engine can supply for himself, by introducing water in place of steam, and remembering that it is not compressible like steam. But by far the most convenient and economical plan for rendering the energy applicable is by the intervention of a turbine, the method of action of which I will try to explain. You all know the way that a screw propeller for a steamer acts; the same type of action is taken advantage of in a turbine. Imagine that you have two boards, one sliding on the other; and that the upper one is fixed, but the lower one free to slide, now let a hole be bored in the upper board slanting from left to right, and one in the lower one from right to left, and let these be placed opposite to one another, it is obvious that if water be forced through the upper hole, it will tend to push the lower board from left to right. If the boards be circular and the holes follow each other all the way round, the lower disc will revolve continuously in the opposite direction to the hands of a watch. This is the principle on which a turbine acts, but of course modified a good deal in practice.

The ordinary form of turbine consists of two wheels, one revolving inside the other, the inner wheel has for its upper surface an iron plate, fixed to

the revolving spindle or shaft that communicates the motion outside the turbine case, to this are bolted pieces of iron plate, forming curved canals to the centre; these canals are curved from left to right, and the plates forming them are bolted to a ring of plate iron at the bottom, thus leaving an aperture for the escape of water that passes through the canals. The external wheel is just the reverse of the internal one, at the bottom, level with the bottom ring-plate of the internal wheel, is a ring-plate of iron, and bolted to this are curved plates forming canals curved from right to left; at the top is a narrow ring-plate, level with the top plate of the internal wheel, and leaving an annular opening on the outside for the admission of water to the wheels; the whole is enclosed in a case of iron. Water enters this case above and comes in through the opening in the top of the outer wheel at some considerable pressure, passes through the canals, and in passing from the outer to the inner wheel, makes this inner wheel revolve, and then escapes at the bottom. The force of revolution of course depends on the amount of water and the depth of fall. There is however a serious objection to this form of turbine which does not exist in the second form that I have to mention; *i.e.*: in entering the outer wheel of the turbine, the motion of the water is changed from a vertical to a horizontal one; and this always causes a loss of force by waste.

The second form of turbine is the kind used at Bellegarde works, to which I shall presently draw attention. It is far more like our first illustration than the form I have just mentioned. It consists of two thick solid plates of iron one placed above the other; the upper one is fixed, which prevents friction against the descending water; in the centre is a hole through which the shaft descends to the lower plate, and below that rests in bearings. In the upper plate are bored rectangular canals curved from left to right, and in the lower are corresponding canals curved from right to left. The water entering from above acts in the same manner as the air in Helmholtz' Siren, which many of you must have heard of this term in connection with sound, and by its powerful reaction forces round the lower wheel in a direction opposite to that of the hands of a watch.

At the little town of Bellegarde in the south of France, a small stream called the Valserine joins the Rhone, which even there is a river of no small size; at the junction of these two rivers is placed a house which holds six large turbines moved by the water of the Rhone. The Rhone here flows through a deep ravine, hollowed out by the ceaseless wear of the water, it is said for seventy-five thousand years. About six hundred yards above the turbine house the Rhone is over hundred yards wide, and suddenly contracts to about six or eight yards and then disappears, at least in dry seasons, altogether into the ground, coming up again a hundred yards lower down,

the total fall of the river in the six hundred yards being in round numbers forty feet (13 m.) To take advantage of this fall a tunnel was bored through the rock about twenty-seven feet wide at the bottom and twenty feet high, from the place where the river is wide, to the turbine house at the junction of the Rhone and Valserine, where it opens into a large reservoir. At the top of this tunnel are flood-gates to manage the quantity of water and a wall a hundred and thirty yards long, out into the river to direct the flow of water to the mouth of the tunnel. The water then from the higher portion of the river comes down to the turbines where it performs the necessary work and then falls into the river at a lower level

The strength of each turbine when in full work is 630 horse power, *i.e.*: each turbine is capable of raising 20,790,000 pounds through one foot per minute, but it only uses 80 per cent of the power of the water which passes through it, *i.e.*, since the water has a fall of 40 feet about 649,700 pounds of water must pass through each turbine per minute, or since there are six turbines 3,898,200 pounds of water must be used per minute; but a cubic foot of water weighs 62 pounds, therefore 62,870 cubic feet of water must be used per minute It is said though that the tunnel passes enough water to work 20 turbines; therefore 209,350 cubic feet of water must pass per minute, or enough to raise the eighty ton gun to the top of the highest mountain in the world in about ten minutes, and this be it remembered is only a very small portion of the water that might be used.

The power given by these machines is hired by manufacturers at £7 per horse power per year to work their machinery.

Small supplementary turbines are used to shut the sluice-gates that admit the water to the large turbines, which can be stopped in two minutes or even less.

The motion is transmitted by means of cables to factories requiring it thus:—The upright shaft coming from the lower wheel of the turbine has a large cogged wheel on the top, this communicates motion to an axle on which are two large grooved fly-wheels, over these are cables which go up to the top of the cliff over-hanging the turbine house, rising 84 feet in a distance of about 60 yards, where is a pillar to support it; in this the upper rope of the cable passes over a small wheel at the top 9 feet in diameter, while the lower returning rope passes over a lower wheel 18 feet in diameter. From this pillar the cable goes on over a space of 140 yards to the next pillar, where it passes over one groove in a doubled grooved wheel, over the other groove another cable passes which stretches on a distance of about 140 yards again to another pillar and wheel of the same sort, and so on over 3 more pillars, and twice across the Rhone again, a distance in all from the turbines of nearly 1000 yards (983 yds.) to some phosphate works. This method of

transmitting motion is so good that in this immense distance and over six pillars, only about 5 per cent. of the power is lost, *i.e.*: if at the turbines it is 630 H.P, at the mill it is 600 H.P.

Over and above the interest attaching to the works, Bellegarde is well worth a visit from the beauty of its surroundings, as you will be able I hope to see from these photographs afterwards, when you can look closely at them. Pitt is said to have called the rapids here a second Niagara.

Now if 10,000 horse-power can be taken from the Rhone in this way in France, why cannot our rivers be used in the same manner to the permanent benefit of our commercial prosperity and the saving of our coal! What if we have no rushing rivers like the Rhone? We are not destitute of water power even in our rivers, and we have an almost infinite source of power in the rise and fall of the tides all round our coast. Some day no doubt this reservoir will be tapped, and I devoutly hope it may be soon. Captain Aylmer, the energetic owner of the Bellegarde works tells me that he is trying to think of some plan for using the tides. I am sure we ought all to wish him the utmost success.

I owe him my best thanks for the help he has given me and for his courtesy in lending and explaining to me these plans and photographs, which I hope you will soon see closer.

After the paper there was a short discussion, in which the Rev. G. C. Bell said that among the very few places where the water power had been turned to account was Bradfield.

There were 39 persons present: 2 hon. members, 17 members, and 20 visitors.

MEETING HELD OCTOBER 23rd, 1879.

P. H. MADDOCK read a paper on

MOTH COLLECTING NEAR MARLBOROUGH.

I DARE say most of you who heard the paper read last term on Entomology think that the only way to get moths is by means of a net or by sugaring trees. I wish now to shew you the contrary. I suppose you know most moths fly about by night, and sleep by day, and if the question were asked, where do moths go in the day, I cannot help thinking the most natural answer would be on trees, because there they can get shelter from wind and rain, and are safer from molestation, as so many of them exactly resemble either the bark itself, or a bit of moss or lichen on the bark, so that they

deceive even the birds. At any rate there certainly is a great variety of moths to be found on trees, and some that are by no means common. I will speak to-night of what may be found on the trees in the Forest alone, and of course there are many I shall omit from ignorance, as I only mention what I have obtained myself. There are several reasons why I recommend looking on trees Firstly because very few people take the trouble to do so, so that there is more chance of success. Secondly because all the earlier stages of a moth, egg, caterpillar, chrysalis as well as the moth itself, my be found on trees, and rearing caterpillars is most essential to entomology, as many moths, alike in themselves, differ in their caterpillars, so that the caterpillar serves to distinguish species. Thirdly because you have no need to bother yourself with a net, a few chip boxes being all you want. Fourthly, I recommend it because it can be carried on with profit all the year round, as I shall presently shew. Fifthly, because those who do not mind a little rain, can go up to the Forest on a wet half-holiday, when there is no cricket, and when once under the trees can search there without being conscious of the rain. In fact I think a windy rain sends more moths than usual on to trees. And lastly I recommend it because, when once your eyes have got used to searching trees, you are pretty certain to get something, whereas if you go to some open place in the forest or elsewhere you *may* get nothing at all. I said that on trees, eggs, caterpillars, chrysalids as well as moths may be found. I will take each of these separately in order.

First the eggs (of course I don't mean birds' eggs, but moths' eggs). These are laid generally upon the branches, but are scarcely ever seen, and do not repay one's trouble in keeping them, for it requires the greatest possible care and trouble to succeed in rearing caterpillars from the egg. So we will pass on to the caterpillars themselves.

These may be found in more or less quantities from April to October. In spring the caterpillars of the Light Emerald and Purple Clay are the commonest, on beech trunks, and a few kinds may also be found on oaks. In September and October numbers of sorts may be seen crawling up and down the trunks of beeches, either going to spin or burrow. A caterpillar of the Lobster moth was found about a month ago, but I am unable to give you the names of any others except those of *Psi* and *Camelina*, because all mine are at present in the chrysalis stage. But by far the most productive way of getting caterpillars is by beating the boughs of oaks and by holding a sheet, umbrella or net under the boughs that are being beaten. Numbers of caterpillars mostly geometers will tumble in, these, in captivity, require a little earth on the bottom of their cage or box, as many of them turn into chrysalids underground. I lost a number of mine last term through my ignorance of

this. The best time for beating is June and the beginning of July. I think as a rule large oak bushes in hedges are even more productive in this way than large oak trees. Some of the commonest caterpillars are those of the 'Thorns.' Then we come to the chrysalids. In order to find these more trouble is needed. They may be obtained in three different places connected with trees. First by pulling off bits of bark or moss on the trunk, secondly by searching carefully the corners formed by the branching roots above the ground, where chrysalids may be seen rolled up in dead leaves, or sometimes simply lying on the surface of the ground without any protection whatever. Thirdly by pulling or digging up the soil round the roots, which is the most popular and productive way; for this latter a trowel or large knife is required and the soil should be searched carefully as it is dug up, since many apparently bits of soil are really chrysalids or cocoons covered with earth. By tearing up the grass at the roots of birches in the Forest, the chrysalids of *Instabilis* and *plecta* may be found pretty abundantly, but oaks that are by themselves or not very near other trees are by far the best. It is of no use whatever to dig where there is a mole's burrow, as moles are better pupa hunters than most entomologists. Pupa digging, as this operation is called, must be practised in the Autumn or winter but not on a very cold day, as the sudden exposure to a freezing atmosphere kills the chrysalids. They may be kept when found in moss or cotton wool, but I do not recommend earth.

Now we will pass on to the moths. I will give you their names as far I can recollect them in the order in which I took them. First comes the Winter moth, which may be found almost everywhere in January, *Progemmaria* and *Aescularia* in March, the *Fagella* in April and May, which latter is so extremely abundant on beech trunks, that I have counted more than a hundred in less than three quarters of an hour, the males come out sometime before the females and have much larger wings. Then come *Prodromaria*, *Lobulata*, *Camelina*, *Taminata*, *Derivata*, *Vaccinii*, *Stabilis*, all of which may be found on beeches in May, though *Camelina* may be seen on birches and occurs till the end of July. In June and July a number may be found of all sorts, among the best I will mention *Aureola*, *Quercana*, *Pruniana*, *Coryli*, *Dolobraria*, and *Fagi*, as well as the commoner *Propugnata*, *Margaritata*, *Nemoralis*, all on beeches; *Variata*, and *Accris*, on firs. In September there are more caterpillars than moths, but *Angularia*, is very common on beeches, and looks very much like a dry yellow leaf. I also took a specimen of *Monacha*, on September 23rd, which is not common. In October and November, *Aurantiaria*, *Defoliaria*, *Dilutata*; and in December the two winter moths. From this I think you will see that looking on trees is not to be despised as a way of getting entomological specimens; but it has

one objection, that at first one finds nothing, and for a long time one may only get one or two specimens altogether, but this need not discourage us, it does not at all follow there are no moths, but we must get our eyes thoroughly accustomed to the darkness of the trunks before we can expect to be very successful, and even then the moths are very hard to see as they look so much like dead leaves or lichen as I said before. A sunny day is not so good as a dull day, because the lights and shadows on the trunk caused by the moving leaves are very confusing. The best side of the trunks for moths is that one which does not get the wind, though some of the commoner moths and most caterpillars seem indifferent to it. Moths are generally found low down near the roots, but it is well to glance up the tree as well beginning from the bottom. My *Prodromaria* and *Nemoralis* were very high up, most of the others low down. The trees that are most worth searching for moths and caterpillars are those between the opening in the middle of the forest and the Savernake Cricket Ground, also the trees on both sides of the first avenue as you go through the opening, but of course many others also are frequented by moths, as I don't know of any peculiarities in trees that they particularly like, though as a rule mossy trunks are the best. The oaks do not produce much except by beating, nor can I recommend any particular ones. The best firs are in the large fir-wood on the left of the grand avenue, near the Hungerford road, where *Silaceata*, *Variata*, *Aceris*, and *Propugnata*, are not uncommon. Thus trees afford work to the Entomologist all the year round. Moths can be got in Spring and Summer, caterpillars in Autumn with a few moths, and chrysalids and a very few moths in Winter. This I think shews the great advantage which Entomology has over Botany and Ornithology, neither of which sciences can be pursued in the winter. Now to those who are not entomologists I say that, if they were, I think they would enjoy their walks much more, and to those that have begun to collect, I may safely say, that they will get something new every time they search trees, if they persevere. I cannot recollect a single day last term when I looked on trees and found absolutely nothing, and this is saying a good deal because I went up at least 6 times a week and very often 8 times. Between 12 and dinner there is plenty of time to visit the nearer beeches in the forest. Then we should remember that in entomology there is and always will be much to be made known as yet unknown, much that is incorrect to be corrected, there are many caterpillars yet to be discovered, and perhaps also many moths not yet seen in Britain, and this should incite us to further, by active labour and energy, a science which though carefully studied for more than a century has as yet not nearly reached perfection.

In the course of the discussion upon this Paper, notice was called to a small Work by the Rev. J. Greene, on Pupa-digging, which gives many useful hints on the subject. Objection was also made to the statement about the impossibility of studying Botany and Ornithology in winter: for though it was very true that *very* little was done at Marlborough, especially in Ornithology, in the winter months, it was because Members would not use their eyes, not from there being nothing to see.

F. S. Alston read a paper on Fritillaries.

The former was illustrated by a box of moths captured during the present season, the latter by some very beautiful coloured drawings of the various species.

There were also exhibited a specimen of the Leopard Moth (*Z. Æsculi*), the first one captured near Marlborough, exhibited on behalf of N. Manders, Esq. Also a Cow-fish and Tropic Bird (*Phaeton æthereus*) from the Bermudas, presented by Lieut. Carpenter, O.M. This bird, called also the Boatswain or Long-tail, is a species of Gull, and flies about in great numbers during the Summer, arriving in Bermuda about the end of April, and leaving about September.

There were 50 persons present: 4 hon. members, 21 members, and 25 visitors.

MEETING HELD NOVEMBER 6TH, 1879.

S. R. BAKER read the following paper on

THE SUPERSTITIONS OF WALES,

Illustrated by several Photographs.

"An old and haughty nation, proud in arms."—*Comus*, l. 33.

THOSE of you who were members of the Society rather more than a year ago may remember a very interesting paper on Cornish superstitions, delivered by a late member of the Committee; and it seems to me that something about the superstitions of the sister country of Wales may be of interest to some of you, especially those who come from 'the land of leeks.' The subject is a large one, as I hope you will see when I come to the end of this paper, as I propose to include the superstitions of a large tract of country known as

the 'Welsh marches,' that is to say, the counties of Shropshire, West Worcestershire, Herefordshire, Radnorshire, and perhaps the north west of Gloucestershire—in fact, all the country west of the Severn. Several castles were built in this region to check the inroads of the Welsh from early times—for instance, Ludlow Castle (famous for the representation of Comus before the then President of Wales, as he was called, the Earl of Bridgewater) was built comparatively late, as was that of Raglan, while that of Chepstow was built as early as 1069. This proves the incessant turbulence of their Welsh neighbours.

So much then for the country and people with whom these beliefs originated. I now intend to take in order such local traditions as will be of interest to people so far from Wales, and next those relating to animals and other things. I must warn you, however, that many of these stories are to be found in other parts of England—some so far away as the eastern counties. Why this should be I cannot tell you, but I suppose they have existed there—or at any rate their prototypes have—ever since the Britons were driven westward by the Romans and Saxons; and such superstitions must therefore have a claim on our interest from their antiquity, if from nothing else.

I must now quote a few words of Mr. Chappel's paper: He told us, as you may remember, that "when the first Christian missionaries dwelt among the people, they impressed them by their bravery and endurance under persecution and by the holy lives they led: being thus *morally* superior to the men of their time, they were represented to their descendants as *physically* so: hence by an easy transition, the ordinary man became a hero, and then a giant, and yet was a saint as well." Now you will find the same thing in Wales to a considerable extent. To take an instance of it, on the Avon above its junction with the Severn there is a cave called Ghyston's, or the Giant's Cave, once the abode of a certain St. Vincent. On one occasion as he was being persecuted by his enemies he tore open the rocks till he had made a place big enough to hide himself in with no other tool but his hands (an obvious confusion between the man who was not strong enough to withstand his enemies and the giant who could perform such a feat as this.) He then attacked his chief enemy, another giant named Goram, and killed him. Before this there had been a great lake above this rock but the rift made by the saint allowed the water to pass through it, and thus formed the Avon. Unhappily for the legend, however, the present cave is not in the middle of the river at all, but high up on one bank, but this trifle in no way shook the belief of the old man who was my authority for the story. The saint afterwards went to Ireland and was murdered at Valencia about A.D. 305. Again in Pembrokeshire there is a cave known as St. Gowan's Chapel: this was also the hidingplace of a gigantic saint flying from persecu-

tion, and as it opened to receive him, he blessed it by allowing it to retain his shape, (according to this, by the way, he must have been at least 30 ft. high,) and by giving it such miraculous power that any one who walks round it against the sun three times and at the same time makes a wish has it fulfilled within the year. This is similar to the use of the Cornish cromlechs alluded to by Mr. Chappel; and I may remark once for all, that though the legends of the two races are not always similar, there is generally an undercurrent if one may so call it, of similarity between them. Like the Cornish, the Welsh are of course Celtic and belong to the same class of Celts, namely, the Cymry, who are also found in Brittany, the Basque provinces and other western parts of France, where all retired before a stronger power. Like the Cornish "they are eminently superstitious by nature, very conservative in their notions, and slow to receive innovations." Again, like Cornwall, the character of the country is suited for retaining superstition. As Mr. Chappel said of Cornwall; "the dark and rocky hills, the bold cliffs, the masses of granite, the old druidic remains, the bleak moorlands, the quaint wells, cromlechs and circles, to all of these superstitions cling." Who then can wonder at the similarity between them? About St. Gowan's Chapel I will only add that the sides of the cave have been roughly squared to make a rude kind of chapel, 20 ft. long by 12 ft. wide. Here there is a miraculous well, also blessed by St. Gowan, and said to have the property of healing lameness and deformity. According to tradition the chapel bell was once carried away by pirates, and accordingly the saint gave the walls the power of resounding like bells when any one struck them *as long as his worship continued*—an ingenious way of evading the natural question, why that power does not still exist.

I will now tell you something about the cromlechs. These, as in Cornwall, are very numerous, and generally consist of three or more supports, with an upper stone often weighing several tons. The most interesting one I know of near Monmouth is not exactly a cromlech, being simply a large stone, pointed at the bottom and widest in the middle, resting on another slab and retaining its position simply by the latter's roughness, although it slopes considerably. It is called the Buckstone, perhaps because the deer shelter under it. It is said that the Druids used it as a sort of ordeal, by setting it rocking, and judging in some way from its motions whether the accused was innocent or guilty.

Another interesting cromlech is Arthur's Stone, near the base of Cefn Bryn, or "The ridge-backed hill," in the south-west of Glamorganshire, about which I shall have something to say presently. It was once supported by nine stones, (but several have either fallen or been removed) and stood in a stone circle something like Stonehenge or Avebury, but much smaller. It is

the largest Druidical relic in Wales except one, which I had not time to see. This is called the Cromlech of St. Nicholas, and is near Cowbridge in Glamorganshire: the upper stone is computed to be 324 feet in circumference and to weigh nearly 30 tons, if I remember rightly.

Another curiosity of Wales is the tidal wave of the Severn, called in some parts of Wales the bore; in others the agger or eager (a corruption of the French *eau-guerre* or water-war.) A MS. by a monk named Nennius, of the 7th century, attributes it to what he calls the Duong Habren, or two kings of the Severn: there were two heaps of froth which collected at the mouth of the river, and as they pushed against each other, drove the water up before them. The cause is now known to be the action of the sea forcing its way up the bed of the river; any one who has seen the sea force itself through rocks as the tide comes in will see what I mean, on a small scale.

There is a story connected with the ferry over the Severn called the New Passage, which is this: Some Welsh gentlemen who had espoused the cause of Charles in the Civil War (as many of the Welsh did) were flying before a party of Republicans and got across into England safely; their pursuers, who came up soon afterwards, told the boatmen they were Royalists, hoping they would be more ready to help them: but instead of that the boatmen, guessing who they were, made them land at a place called the English Stones, some little way from the Gloucestershire coast, where the tide came up and drowned them.

Going down the Glamorganshire coast you next come to Chepstow, where off Beachley Cape you see a small island of some interest; it is that of the first female Christian martyr St. Tecla. Some little way lower down is Tressilian Cave or Church where once marriages are said to have been celebrated,—a sort of Welsh Gretna Green. At the farther end of it is an arch called Dwynwen's Bow of Destiny, about which it is said that the unmarried person who throws a stone through the arch three times running from a certain distance will be married within the year; every failure delaying the interesting event one year more. A little farther along the coast is Dunraven Castle, about which there is a story connected with the infamous practice of wrecking; the owner of the castle, Walter Dunraven by name, leagued himself with a notorious wrecker called Matt, of the Iron Hand. This man, who really hated Mr. Dunraven, pretended to make a mistake and wrecked a vessel which contained Mr. Dunraven's three sons, and meeting their father afterwards in the dark, after promising to do something for him, gave him in pledge, not his own hand but the cold hand of his murdered eldest son. The consequence was that the wretched man fled from the castle and from his ill gotten gains into retirement near Tenby, where he died.

We now come to a very curious part of Wales indeed, a little peninsula in the S.W. of Glamorganshire, 15 miles long by about 6 or 7 broad, called the Gower. Its history is this: in Henry I's reign a colony of Flemish weavers and cloth workers were sent into Wales, some of whom settled in the Gower, and others at Haverfordwest in Pembrokeshire and other places. Several castles, such as those of Oystermouth, Webley, and others were built for their protection against the Welsh, and there they became naturalised. Some of their descendants inter-married with the Welsh and learned their language, but the majority speak English mixed with several corrupted Flemish words. In the Gower is the mountain of Cefn Bryn and Arthur's Stone, which I have spoken of before; another place of interest is the promontory of the Worm's Head, so called from its appearance to people out at sea. Under it there is a cavern 300 yards in length, which is connected by superstition with beings resembling the Cornish knockers and pixies. Leland the antiquary mentions a belief of the existence of a small door at the farther end into the earth, but few, if any, persons have ever got in far enough to see.

Another object of interest is the Blowhole or Rhossilly barometer; this is a hole in the ground opening into a cave which is sometimes filled by the tide; on these occasions the air rushes out of the hole with great violence, making a noise something like a common foghorn; and this noise is supposed to foretell the weather.

I have now to speak about one more well known object of interest someway farther up the coast: this is the Devil's Bridge. The present bridge is comparatively recent, but its predecessor, which was about 20 feet below it, is the subject of much conjecture: some think it to have been built by the Abbey of Strata Florida in 1087, but unhappily the Abbey did not exist for another century; others that it was built by Satan to show men what he could do, but in all probability it was built by the Knights Hospitallers somewhere about 1200, and the name "Devil's Bridge" only arises from its high position, because in the west country the name of the Devil is often given to anything deep or high: thus the Devil's Dip and the Devil's Punchbowl are the names of two steep valleys in Worcestershire; and the Devil's Chimney of a part of a hill in Gloucestershire; and there are plenty of other instances, as the Devil's Den here.

Mr. Chappel noticed in the course of his paper that while in other counties most queer formations of rock are connected with the devil, in Cornwall he is rarely associated with them. This is also true in the most western part of Wales proper, but in the eastern part and in the Marches his name is often found. I have already mentioned the Devil's Chimney, Dip, and Punchbowl; I will now mention one more which is the Devil's Spadefull or Spittlefull.

What the last name means I do not know, but the meaning of the first is plain enough, the legend being almost exactly the same as that of the Wrekin in Shropshire and Martinsell. The story, which I cut as short as possible, is this: The ground by the Severn on which Bewdley in Worcestershire now stands, once belonged to the devil, and he was very angry at its being taken away from him. He accordingly determined to dam up the Severn and drown the town, and so he took a shovelfull of earth and started on his enterprise. On his way he met a country cobbler coming from Bewdley home with a number of old shoes for repair, and on asking how far it was to Bewdley the man (who, we must suppose, caught a glimpse of the cloven hoof) told him that he had worn out all those shoes coming from Bewdley thither. The Devil, naturally very much disgusted, shot down the earth where he stood, and thus formed the hill. There is a similar story about a hill called Barrow Peak, in which the earth was carried in a wheelbarrow.

Another story of the devil's power is this: between Cheltenham and Gloucester there is a village called Churchdown or Chosen, which consists only of a few scattered houses and a church, the said church being right away from most of the houses, perched on top of a hill about 800 feet high. The story about it (which I suppose to have been made simply to explain its rather eccentric position), is this: The church was intended to stand at the *base* of the hill, but the devil wished to give the people some trouble by making them climb the hill to go to church, so he accordingly moved all the stones placed at the bottom up to the top every night. The people, seeing I suppose, that, as some one was kindly doing all the carrying for them gratis, it would not matter so much, built the church as the devil wished, and there it stands to this day. Another story ascribes the devil's work to the Virgin Mary, but as the church was built before the Reformation, most of it being Norman, it is hard to see her motive.

There is also some trace of witches in Wales connected with places: at least I know of one wood called Witchery Hole or The Witches' Hole, once the abode of three witches, according to an authentic Radnorshire story, and no doubt there are others: I shall speak of one presently.

There are of course several legends of the patron saint St. David, but many of them are confused with legends of other saints which I have already told you. One is that as he was preaching, the earth gave way under him and from his weight he sank in some way: however he soon got out again and by his preaching made the earth not only rise and fill the hole; but rise into a mound, on which Llandewi Church stands now.

I hope you will pardon me for intruding before you so many stories connected with places of which few can interest anyone here: I shall now pass on to speak of a few of their beliefs about other things, but I will first finish

what I have to say about giants. I shall only speak of two, one a comparatively nameless personage who lived near Bewdley (the place I mentioned before). No one knows what his name was, but his grave is still shown at Habberley valley, near Bewdley, and is nearly 12 feet long. This gentleman is said to have been very fond of blackberries, and as he was stooping over into the valley to gather some, he overbalanced himself and broke his neck. Another story about him is that his nails were so large that they supplied Bewdley with horn for making lanterns with for a hundred years! This does not agree very well with the present length of his grave, which we can only suppose to have formerly been larger. The other giant's exploits are recorded in the following interesting poem:

"Robbin-a-Bobbin-a-Bilberry-Ben
Ate more victuals than three score men,
A cow and a calf, an ox and a half,
A church and the steeple and all the good people,
Everything lean and everything tough,
And then he declared he hadn't had enough."

This gentleman when a boy ran away from his parents and joined two other giants, Bobbin and Bilberry whom he eventually killed and took possession of their cave. He then made continued inroads into his native village and compelled the inhabitants to supply him with loaves of bread, oxen, horses, and sheep. Finding this not enough, he went down one Sunday during service, picked up the church with all the congregation inside and swallowed it whole. This was rather too much of a good thing, and so the marauder found it for the patron saint of the church changed him into a rock, inside which the ringing of the bells and music of the organ can still heard, only the legend does not specify where the rock in question is to be found.

The Welsh also have a belief in a class of spirits something between fairies and demons,

"Too black for heaven, and yet too white for hell."

Thus an old lady told me that she perfectly remembered a meeting of 20 preachers to combat with their prayers against one of these spirits who had tempted people with what seemed to them to be bars of gold near a causeway called Sam Helen. This same place of Sam Helen seems to have been a favourite place of these spirits, for this same lady remembers a report which caused some considerable local excitement at the time, that a cavalcade of 50 or 60 of them had been seen, mounted on white horses no bigger than terrier dogs, all of which disappeared into the Sam Helen.

Then of course there are the regular fairies or Tylwyth Teg, but unhappily I could not find many Welsh fairy stories, and those I did find are very like those of every other country, concerning fairy rings and other of

their haunts. In some places the family never go to bed without leaving a tub, or at least a pail of water for them; if this were neglected, the fairies would pay them out in all kinds of ways, riding their horses to death, stealing or changing their children, bringing ill-luck on their cows and sheep, so that their young would all die, &c. There are also stories similar to those in Germany of persons who have seen the faries, and by some means obtained authority over them and lived among them for a time in great splendour, and of others whom the fairies have compelled to serve *them*, of men who have sold their horses or cattle to little strange men and seeing them instantly sink into the earth; of apparitions of spirits in the form of animals and many others. To take one as a specimen, there is a story of a fiddler who agreed with a person he had never seen before, to play to a party to whom he should be brought for the twelve days of Christmas; but no sooner was the bargain struck, and the fiddler had received some earnest money, than the stranger vanished into the earth. The poor fiddler, thinking he had entered into the devil's service, had recourse to a clergyman, who advised him to go, but to play nothing but Psalm tunes. On the appointed day he was brought to the top of a hill by the stranger, and ordered to play; but as soon as he struck up a Psalm tune, the company all vanished, leaving him much bruised and hurt, though how he could not tell.

The same remarks apply equally to ghost stories, which are very like any others. In one country house where I once stayed, a noise like a door slamming was heard exactly at midnight at intervals of a few days; but the ghost was not kind enough to come while I was there—except once when I was asleep of course.

The Welsh have some curious beliefs respecting animals. They think that all black cats are possessed with a devil and never allow black kittens to live. On one occasion when some friends of mine were travelling through Wales to Beaumaris many years ago with a black cat and had stopped at an inn for the night, the landlord came up into the children's room in the middle of the night with a long knife, saying he was come to kill the cat, and was with great difficulty induced to leave it alone. Ravens also they consider unlucky, also magpies, about which I have seen the following rhyme:

"One for sorrow, two for mirth,
Three for a wedding, and four for a birth."

If a hare crosses your path, you must turn back and go by another. Screech owls are also connected with death by the Welsh, and anyone who hears them three nights running will die within the year. Something like this is alluded to in the ballad of Cumnor Hall, from which Sir Walter Scott's tale of 'Kenilworth' originated:

"A death-bell thrice was heard to ring,
Thrice an aetherial voice did call,
And thrice the raven flapped his wing
Around the towers of Cumnor Hall."

The Welsh children also used to use the common Lady-bird, or as they call it 'Lady-*cow*' as a barometer, by holding it on their hands and singing a verse of which this is the translation:

"Little speckled cow,
Will it be rain or fair weather?
If rain, fall down,
If fair weather, fly away."

Bees were supposed to be intimately connected with the welfare of a house, like rats and crickets are. If the master of a house died, crape was put on the hives, and the oldest servant in the house took the house door-key (also wrapped in crape) and after knocking at each hive with it three times, pronounced this verse over it:

The master is dead,
But do not you go:
For the mistress will be
A good mistress to you."

There used to be a strong belief in witchcraft in Wales, as in England, as in the case of Witchery Hole which I mentioned before, but which is of course fast dying out. There are still however old women calling themselves 'white witches' or 'wise women.' One of these women—whose name I need hardly say was Betty Jones—I myself remember giving me something for the cure of a wart, but I do not think it went away much quicker for her remedy, which was simply a piece of wood steeped in some liquid, in which I had to make a fresh notch every day and lay it on the wart. This woman drove a very profitable trade by begging, chiefly from the small farmers who abound in Worcestershire, saying that if they did not give her what she wanted, she would make their milk and cider go bad, their cows and ewes die, their apples rot, and a number of similar misfortunes. She then began to try a similar plan with my father, but naturally finding it did not answer very well, she had recourse to another. She used to come with a very mysterious face and tell him that she had heard a strange noise in the air, which meant that he had got a pair of old boots for her—or whatever it was she required: and if I remember rightly, she generally found it answer.

I think I have now said enough to show you what a large subject the superstitions of Wales form. Most of them, as I said at first, are closely connected with localities; and of these I have only taken a few belonging to two or three counties, to give you some idea of what the extent of the whole is.

But as in Cornwall so in Wales, superstition is fast melting away before the face of the English civilization, language, manners, and customs, with which the introduction of railways all through Wales has brought them so much more in contact. At present the children pick up Welsh from their parents and learn English from their schoolmasters, and the result is that they speak both languages equally well—at all events in South Wales: but what may happen in another century or two it is impossible to say. In the words of our great modern poet, which he puts into the mouth of the great King of Wales,

"The old order changeth, yielding place to new."

Eisteddfods and similar ceremonies may preserve the language for a time; but we know that the Cornish language has now quite disappeared, taking many of its superstitions away with it, and we can only fear that the sister tongue will in the nature of things follow its example. But, however this may be, I hope, that at any rate something of what I have told you has given you a clearer idea of the former condition of this most ancient and interesting people.

A Photograph of the Upper School, as it appeared when fitted up as a Temporary Museum for the Wilts Archæological Society, was exhibited.

Also the Stamp Album, which had been enriched by 29 extra stamps, presented by Rev. J. Sowerby.

There were 33 persons present: 2 hon. members, 13 members, and 18 visitors.

MEETING HELD NOVEMBER 20TH, 1879.

G. F. Rodwell, Esq., gave an account of his Recent Visit across Iceland.

The President exhibited one of Negretti and Zambra's Patent Deep-sea Thermometers, and some *recent* Fossil Fish from Greenland. The fish fossilize themselves by running into mud at spawning season.

There were 47 persons present: 5 hon. members, 12 members, and 19 visitors from the School, and 11 visitors (including 6 ladies) from the Town.

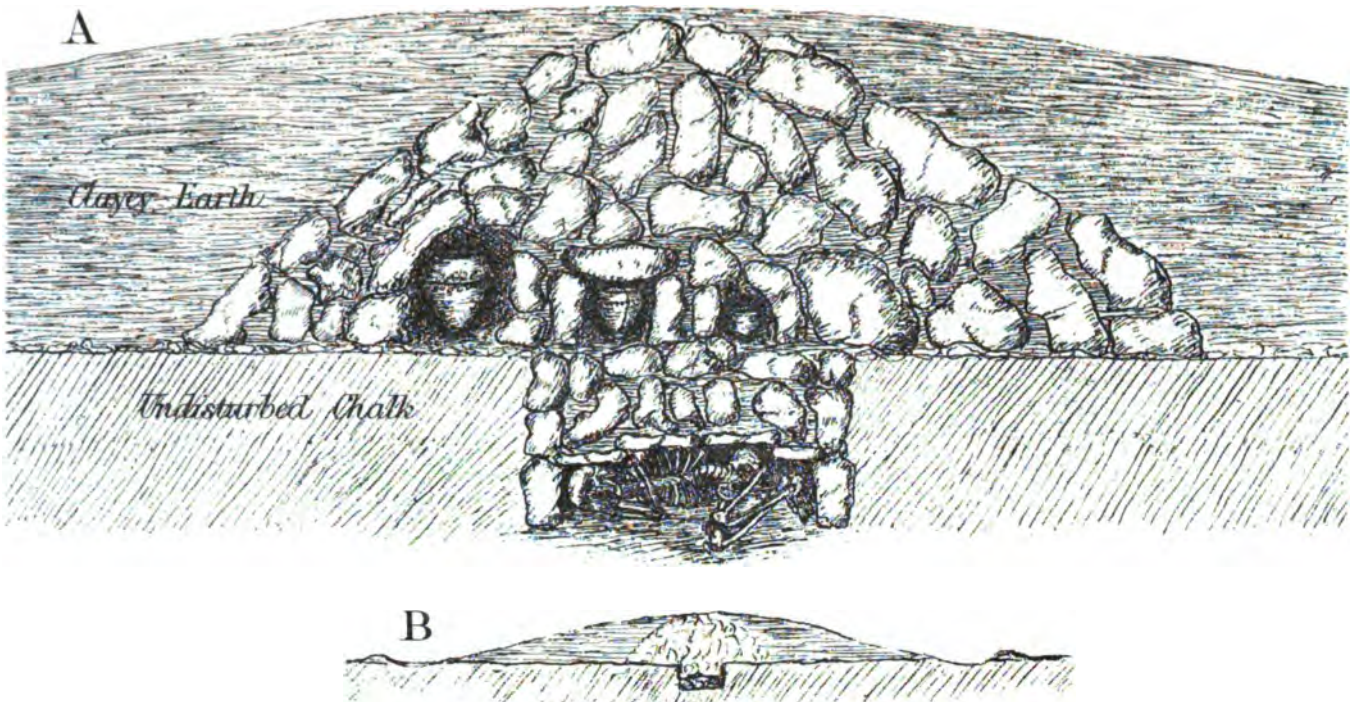
MEETING HELD DECEMBER 4TH, 1879.

The President gave short accounts of the opening of the Lady's Barrow at Rockley, and of the Manufacture of Thermometers.

NOTES ON THE OPENING OF ROCKLEY BARROWS.

On the occasion of the meeting of the Wilts Archæological Society at Marlborough in August last, it was decided to open some of the Rockley Barrows in the hopes of finding something of interest. The first which was opened was a very low one on the right of the road leading past the belt of fir trees surrounding Mr. Tanner's Estate. A trench due East and West was run through the centre across the barrow, and very nearly in the centre was found the interment. It was a very simple affair; the body burnt, and the ashes deposited in a hollow scooped out in the natural chalk. Shortly before reaching the interment, a few pieces of a small cup had been found; this had probably been inverted over the ashes, but had subsequently been broken and moved from its original position by the plough, as the land there had been at one time under cultivation, but had been afterwards left as not being sufficiently rich for anything but pasture.

A second Barrow, still nearer the high road, was now opened in the same manner; *i.e.*, by running a trench due East and West through the centre. Before reaching the centre, the bones of two or three adults were uncovered. The skeletons were not perfect, and the skulls were in so many fragments, that it was doubtful how many bodies had been originally placed there. This was what is known as a "second interment"— a very common occurrence; the barrow being opened, often several times, for the purpose of burying bodies, as, when once made, it is considered sacred. The most interesting fact connected with the bones now found is that "one of the large bones had been broken across, apparently at the death of the human being, for it was evident that it had not been disturbed, the position of the leg and arm bones showing that the bodies had been buried with their arms and legs 'folded up' against the body." The destruction of the skulls was due probably to the action of the plough. On reaching the centre of the mound (not however exactly in the centre), the "primary interment" was found, in this case, consisting of an urn in which the ashes of the dead had been deposited, and then the urn turned topsy-turvy, mouth downwards. The urn was not in an upright position, having been probably forced to one side as before by the plough. It had been protected by a covering of stones, but as they did not fit side by side, the soil had made an entry, and the urn was entirely buried in earth. From the very inferior state of the pottery, being scarcely burnt through, and the sodden state of the vessel, the removal was a matter of great difficulty; in fact, ere its ultimately reached Devizes, it had separated into a very large number of pieces, but has been very carefully restored by Mr. Cunnington and his family.



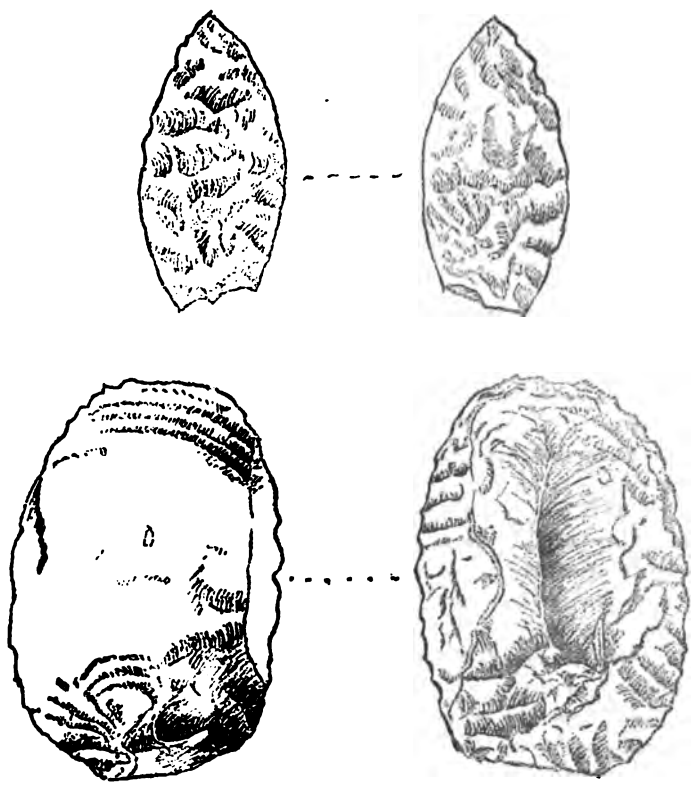
B. *Section of ancient British Barrow at Rockley, N.Wilts. Scale* $\frac{1}{360}$

A. *Enlarged view of the central portion of the same. Scale* $\frac{1}{48}$

Whiteman & Bean, Fleet Lane, London.

During the excavation, a sharp look-out had been kept for "flint implements and flakes," several of the latter were found, but of the former only two; but one of these was a most perfect specimen, almost as fine a specimen as any known. It is extremely thin, and most carefully worked.

Through the kindness of Rev. A. C. Smith, we are enabled to give figures of these two specimens, the upper one is that of the finely worked arrow head.



The unexpected success attending the opening of these two barrows (for barrow opening is often a fruitless task), led to the opening of a third one in the belt of fir trees. There are no less than eleven barrows in this belt, but all very large, and time would not allow of any great time being spent upon them. However one was selected, which proved to be one of the most interesting barrows ever yet opened.

In this Barrow were found no fewer than three urns, deposited in cells formed of rough Sarsen stones, besides a skeleton carefully deposited in a "cist" or hollow dug below the natural surface of the ground. Mr. Cecil Cunnington directed the excavations, and though his kindness the committee have been enabled to give the illustration issued with this description. That illustration is drawn to scale by Mr. Cunnington, and an accurate description is appended, in his own words.

"The Barrow is what is termed a bell-barrow, being surrounded by a 'vallum,' at a distance of ten feet from the base; its height is 6½ feet; its diameter 110; and had been much disturbed by rabbits superficially. It was opened, as in the other cases, by digging a trench from East to West through the centre. The greater part of the Barrow was of a loose clayey earth (surface soil), which lay on a single layer of flints. At the centre was a large heap or cairn of Sarsen stones. The diameter of the cairn was 20 feet, and height 6 feet. The stones had evidently been arranged so as to give a uniform appearance to the whole. The external ones were large and flat. At a distance of 8 feet from the boundary of the cairn, on the East side, we came upon the large urn. Its height is 16 inches, and its diameter 13 inches. The clay of which it is made is very rudely baked, only the external part being at all red. It had a coat of unburnt black clay, about half an inch thick, which covered the whole of the outside. The clay of which it is made is freely mixed with small pebbles and sand, and the rim is ornamented with horse-shoe-shaped impressions. It contained the bones of an adult.

The next urn was within two feet of the centre of the cairn. It is better made than the former. Its height is 9½ inches, diameter 9½ inches. The bones which it contained were too burnt and broken to tell the age, &c., of the subject of this cremation.

Near this urn were the remains of a little food vessel, which had been broken by a prehistoric falling on the stones; the edges are worn with the trickling of water.

The cist was dug in the chalk, not quite at the centre of the barrow. It is oval, covering six feet in its long diameter, 4½ feet across, 3½ feet deep. It was lined carefully with flat Sarsen stones; the top part of it was full of stones and earth, which I think had fallen in when Urn II was interred, for I am inclined to think that the cist originally arched over, but that the arch was broken up subsequently at the interment of that urn. The skeleton was at the bottom of this cist, it lay with its head to the South, on its right side, with its hands in front of its face, and its knees bent. It was enclosed in a chamber or coffin of flat stones.

The skeleton is probably that of a man (Prof. Carnow's opinion), though the Sacrum and some of the other bones are certainly of a female type; but their great strength and the prominent markings for muscular attachments indicate that the person to whom the skeleton belonged was much too strong for a woman.

The skull is much larger than the average modern European; it is of the Brachycephalic type, common to the Roman Barrows. The teeth are much worn by the grit, which he ate with his food, but they show no sign of decay, although their owner must have been at least 55 years old at his death. His height was 4 feet 4 inches.

The Barrow belongs probably to the early Bronze Period, for the style of interment employed was fashionable about that period. There were no implements, ornaments, or pottery found with it.

If the implements found in the Barrow on Ogbourne Down belonged to the primary interment, and the primary interment was the bones found near the surface, which had been moved by a prior investigation, they would serve to confirm the period as that of the Early Bronze."

It may be mentioned, that on the discovery of the first urn, its state was such that the very greatest care had to be taken in the removal, and yet it reached Devizes in no less than 90 pieces. The three urns are now to be seen at the County Museum at Devizes, where the contents of many other Barrows are most excellently displayed.

The urn was removed by first bandaging it up with gummed paper, then a series of linen bandages, and finally a series of linen bandages covered with plaster of Paris. In the opinion of Mr. H. Cunnington, this made the whole affair too heavy, and his greater experience suggested emptying the urn of its contents and then filling in hay and other light materials, which would have served to support the sides. As there are other Barrows to be opened, this is put on record here for further use, in case any fragile vessels are discovered.

Two other Barrows in this belt of Fir Trees were subsequently opened, but after a whole day's work, and employing 11 men, nothing beyond a small quantity of wood ashes, rewarded the excavators for their trouble.

There were 26 persons present: 1 hon. member, 12 members, and 13 visitors.

ORNITHOLOGICAL NOTICES.

Though we have succeeded in securing *some* notice or other to almost every species in our list, it is not as complete as could be wished. Our thanks are due to Mr. Coleman, not only for many notices of the commoner Birds, but also for a considerable number of the Rarities. The extreme cold in January brought a large number of stray visitors to the neighbourhood.

Names of those whose Initials occur in the following list:—

J.W.A.	J. W. Adamson
A.E.A.	A. E. Aldworth
F.S.A.	F. S. Alston
P.A.B.	P. A. Butler
H.A.C.	H. A. Clark
C.	Mr. Coleman
H.J.C.	H. J. Cooper
C.E.C.	C. E. Cooper
H.D.D.	H. D. Drury, Esq.
A.D.	A. Dumbleton
F.G.E.	F. G. Eyres
H.R.F.	H. R. Freeman
D.A.H.	D. A. Hailes
J Z.H.	J. Z. Hamilton
C.H.H.	C. H. Hooper
H.R.H.	H. R. Hordern
H.A.H.	H. A. Hartley
C.H.	C. Hartley
N.Ma.	N. Manders, Esq.
H.R.M.	H. R. Manton
N.M.	N. Masterman, Esq.
G.T.K.M. ...	G. T. K. Maurice
D.J.M.	D. J. Mounsey
S.A.P.	S. A. Pearse
E.P.	E. Prest
H.R.	H. Richardson, Esq.
P.A.S.S.	P. A. S. Sheppard
T.N.H.S.	T. N. H. Smith, Esq.
A.S.	A. Soames, Esq.
M.T.	M. Tanner
E.G.W.	E. G. Waddilove
S.B.W.	S. B. Wilson
D.H.W.	D. H. Wise
O.W.	O. Wynne

Kestrel—2 eggs, May 10, H R.H.; 5 eggs, May 10, N.M.
Sparrow Hawk—1 egg, May 24, D.H.W.
Long-eared Owl—4 eggs, March 19, N.M.; 2 eggs, May 10, N.M.; young out from nest, May 3, N.M.; second brood, same nest, May 10.
White Owl—
Tawny Owl—3 eggs, March 19, H.A.C.
Red-backed Shrike—2 eggs, May 27, C.
Spotted Flycatcher—Seen May 26, E.G.W.; 3 eggs, June 10, G.T.K.M.; 4 eggs, (hard set), June 18, C.H.
Missel Thrush—1 egg, May 17, J.W.A.
Song Thrush—2 eggs, April 5, C.H.; young, June 4, H.R.H.
Blackbird—3 eggs, May 15th, D.H.W.; young, May 15th, D.H.W.
Ring Ouzel—
Hedge Accentor—3 eggs, April 22, H.J.C.
Redbreast—5 eggs (hard set), May 8, A.E.A.; young fledged, May 31.
Redstart—Seen April 12, N.Ma.; 4 eggs, May 16, H.R.H.
Stonechat—[2 eggs, May 31, E.G.W.]
Whinchat—
Wheatear—Seen April 19, A.S.; 5 eggs, May 24, C.
Grasshopper Warbler—4 eggs, May 26, H.R.M.
Sedge Warbler—4 eggs, May 20, C.H.
Reed Warbler—1 egg, June 4, H.R.H.
Nightingale—
Blackcap—[4 eggs, June 17th, F.S.A.]; young, June 8, H.A.H.
Garden Warbler—4 eggs, June 15, C.H.
Whitethroat—4 eggs, June 18th, C.H.H.
Lesser Whitethroat—Seen May 31, E.G.W.
Wood Warbler—
Willow Warbler—Seen April, C.
Chiff-Chaff—Heard March 18, E.P.; seen April, C.
Golden-crested Regulus—6 eggs, May 26, C.
Greater Tit—Singing February 4, E.G.W.; eggs, May 27, C.; 4 eggs, May 31, H.J.C.
Blue Tit—Eggs, May 27, C.
Cole Tit—
Long-tailed Tit—5 eggs, May 30, C.
Pied Wagtail—5 eggs, May 16, C.E C.
Grey Wagtail—
Tree Pipit—Eggs, June 12, C.
Meadow Pipit—
Skylark—Singing February 4, E.G.W.; 1 egg, May 22, F.G.E.

Bunting—
Black-headed Bunting—Eggs, May 12, O.W.
Yellow Bunting—2 eggs, May 17, C.
Chaffinch—1 egg, May 15, H.J.C.; 3 eggs, May 17, O.W.; young, June 18, C.H.
House Sparrow—3 eggs, May 8, E.G.W.; 1 egg, May 12, C.E.C.; young, June 30, H.R.H.
Greenfinch—4 eggs, May 17, M.T.; young, July 8, H.R.H.
Hawfinch—
Goldfinch—
Linnet—4 eggs, May 12, A.D.
Lesser Redpole—
Bullfinch—[4 eggs, June 28, P.A.S.S.]; young, June 29, H.R.H.
Starling—5 eggs, May 12, H.J.C.; young, May 29, H.R.H.
Carrion Crow—1 egg, March 26, P.A.B.; 2 young, May 10, H.R.H.
Rook—Congregating, February 12; eggs rather hard set, March 18, H.R F.; young, May 27, H.R.H.
Jackdaw—4 eggs, May 3, H.J.C.: young, May 29, H.R.H.
Magpie—3 eggs, April 16, H J.C.
Jay—6 eggs, May 18, O.W.
Green Woodpecker—2 eggs, May 26, C.
Creeper—6 eggs, May 3, J.Z.H.; young, May 24, H.R.H.
Wren—Nest, March 29, H.R.F.; 2 eggs, May 13, O.W.
Nuthatch—4 eggs, May 30, C.
Cuckoo—Heard April 19, C.; 1 egg, June 5, H.A.H.; 1 egg in Robin's nest, June 5, H.A.H.; 1 egg in Wagtail's nest, June 21, H.R H.; heard July 13, C.
Kingfisher—1 egg, May 6, H.R.H.; young, June 24, H R.H.
Swallow—Seen April 7, C., April 4, E.G.W.; 2 eggs, June 20, H R.H; young, June 12, N.M.; last seen Sep. 20, C.
Martin—Seen April 2, C.; last seen, Sep. 28, C.
Sand Martin—6 eggs, June 5, H.J.C.; young, June 22, D.A H.
Swift—Seen April 30, E.G.W.; 2 eggs, June 4, H.J.C.
Goatsucker—
Ring Dove—[1 egg, May 16, C.E.C.]; young, May 7, H.R.H.
Stock Dove—2 eggs, March 31, H.R.H.
Turtle Dove—Heard May 29, H.R.H.; 1 egg, June 17, M.T.
Pheasant—12 eggs, May 23.
Partridge—Paired February 8, E.G.W.; 12 eggs, June 5, H D D.
Red-legged Partridge—5 eggs, May 17, H R.F.
Quail—

Peewit—3 eggs, May 4, H.R.H.; young, May 6, H.R.H.
Land Rail—Heard May 9, H.R.H.; 7 eggs, May 10, D.J.M.
Water Rail—
Moorhen—[8 eggs, May 17, H.J.C.]; young, May 17, H.R.H.
Coot—Young, May 28, C.
Wild Duck—7 eggs, May 17, H.J.C.; young, June 17, H.R.H.
Little Grebe—Eggs May 6, H.R.H.; young, May 6, H.R.H.
Heron—Eggs April 28, A.S.

OTHER NOTICES, &c.

The severe winter caused Herons, Wild Ducks, Teal, Kingfishers, &c, to be seen in great numbers round Marlborough, and birds generally were caught very extensively.

Snow Bunting—Taken for the first time at Marlborough in December, and again on Jan. 1.

Eared Grebe—Caught Jan. 27 near the Burnt House. It was kept alive for some time, but afterwards killed and preserved. The specimen was identified at the British Museum.

Red-headed Pochard—One shot at Ramsbury, Feb. 8; one also shot by the *Rev. C. Soames.*

Snipe—7 seen at Poulton, Feb. 17, S.A.P.

Hoopoe—One seen at Snail Hill by Mr. Brooks (who shot the former specimen recorded) in the week after Christmas.

*Peregrine Falcon—A male shot Nov. 22, 1878.

Buzzard—Seen Ap. 2 at Everleigh, by T.N.H.S., and N.M, and again July 19 by H.R. and N.M.

Jack Snipe—Seen March 7.

Great Plover—Seen Ap. 19, A. Soames, Esq.; 2 seen May 4 (building), H.R H.; seen by N.M.

Golden Plover—3 eggs, June 9 (Sneen Hill, Ogbourne), C.

Lesser-spotted Woodpecker—2 males seen at Wye House; one killed, C.

Fire-crested Regulus—Seen May 29, S. B. W.

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*A pair lived in Salisbury Cathedral for several months, and now (May 17) have a nest among the pinnacles. "The hen is no longer seen, but the cock goes out every day, rising in circles to a great height, and returns with food. The pigeons and jackdaws, which swarm on the Cathedral, do not seem to be afraid of him."—(*Field* of May 17).

Sea Gull—Seen March 16, Miss Tanner; Ap. 1, E.G.W.

Cuckoo—Specimen killed by Railway Engine at Little Bedwyn, C.

Kingfisher—One killed by frost at Ogbourne, more seen about Clatford and Lockeridge than have been noticed for years past, C.

Land Rail—One killed by telegraph wires May 16, C.

Rook and Jackdaw—Varieties with brown wings and tail. Pied variety in the wilderness.

Raven—Pair built near Silbury early last year (from the Falconer of the Hawking Club).

Puffin—Two seen at a pond near the Warren by M. Rendle, St. Catherine's, Savernake Forest, one of which was captured Nov. 21, 1879.

"Eggs have been noticed to be very small in many cases, and very irregular in shape."—C.

ENTOMOLOGICAL REPORT.

LEPIDOPTERA.

Very satisfactory work has been done, especially considering the unfavourable weather. Larvæ have been very abundant and a few species have been reared, but it was remarkable how many died before they came to perfection, and this not from neglect, but apparently from some influences connected with the weather. Of those in the School Maddock must be particularly mentioned: our thanks, as usual, are due to N. Manders, Esq, for much valuable help, which we are now about to lose in consequence of his having to reside elsewhere.

Names of those whose initials occur in the following list:—

J. W. Adamson	J.W.A.
A. E. Aldworth	A.E.A.
F. S. Alston	F.S A.
D. L. Bigge	D.L.B.
F. E. Cole	F.E.C.
Mr. Coleman	C.
C. E. Cooper	C.E.C.
H. J. Cooper	H.J.C.
Rev. G. W. DeLisle	G.W.D.L.
C. Elton	C.E.
D. A. Hailes	D.A.H.
H. A. Hartley	H.A.H.
A. J. Hulcatt	A.J.H.
C. G. Kennedy	C.G.K.
Sir John Lubbock, Bart, D.C.L., F.R.S. M.P.	J.L.
P. H. Maddock	P.H.M.
N. Manders, Esq.	N.M.
W. Mansell, Esq.	W.M.
Miss E. A. Ormerod	E.A.O.
C. E. Pine-Coffin	C.E.P.C.
G. B. Routledge	G.B.R.
P. A. Sheppard	P.A.S.
E. G. Waddilove	E.G.W.

RHOPALOCERA.

Gonepteryx Rhamni—Mch.6,H.A.H. F.E.C.; June 13, E.A O.; Sep. 14.
Pieris Brassicæ—May 23, N M.
Rapæ—Ap. 3.
Napi—(Ap.3,E.G.W. *seen*); May 4, N.M.
Anthocharis Cardamines — May 31, A.J.H.
Arge Galathea—July 30.
Lasiommata Ægeria—May 19,H.J.C. July 18, N.M.
Megæra—June 10, G.B.R.; Sep. 29, H.A.H.
Hipparchia Janira—July 11, P.H.M.
Tithonus—Aug. 5, N.M.
Hyperanthus—July 15, H.A.H.
Cœnonympha Pamphilus — June 6, P.H.M.
Limenitis Sibilla—Aug. 2, N.M.
Apatura Iris—Aug. 2, N.M.
Cynthia Cardui—June 6, F.S.A.; Aug. 4, N.M.
Vanessa Atalanta—Mch. 19, N.M.
Io—Mch. 8, O.G.K.; May 31.
Polychloros — Mch. 19, N.M : May 14, C.; Sep. 27, G.W.D.L.
Urticæ—Mch. 11, May 23, Aug. 1, N.M.
Argynnis Paphia— July 18, J.W.A.
Adippe—Aug. 4, N.M.
Aglaia—Aug. 4, N.M.
Selene—June 18, P.H.M.
Euphrosyne—June 18, N.M.
Thecla Rubi—June 18, N.M.
Chrysophanus Phlæas — June 4, P.H.M.
Polyommatus Alsus—Aug. 1, N.M.
Alexis—June 11, P.H.M.
Agestis—Sep. 14, N.M.
Thymele Alveolus—June 4, F.S A.
Thanaos Tages—June 4, P.H.M.
Pamphila Linea—Aug. 1, N.M.
Sylvanus—June 21, P.H.M.

HETEROCERA.

SPHINGINA.

Procris Geryon—June 28, N.M.
Statices—June 30, N.M.
Anthrocera Loniceræ—July 30
Filipendulæ—July 30.
Smerinthus Ocellatus — July 20, C E.C.
Populi—June 15, N.M., (*bred*).
Sphinx Ligustri — July 19, *Miss Soames*.
Chærocampa Elpenor—Aug. 30, N.M (*larva*).
Macroglossa Stellatarum—June 19, O.E.
Trochilium Tipuliforme — July 28, *Mr. Coleman*.

BOMBYCINA.

Hepialus Lupulinus—June 10, N.M.
Humuli—July 5, D.A.H.
Velleda—July 5, P.H.M.; June 30, N.M.
Zeuzera Æsculi—Sep. 6, N.M.
Cossus Ligniperda—Sep. 8, N.M.
Stauropus Fagi—July 24, P.H.M.
Notodonta Ziczac—May 21, N.M.
Lophopteryx Camelina — May 4, P.H.M.; July 8, P.H.M.
Psilura Monacha—Sep. 23, P.H.M.
Dasychira Pudibunda—June 30, July 4, P.H.M.
Demas Coryli—July 4, P.H.M.
Orgyia Antiqua—Sep. 14, N.M.
Porthesia Auriflua—Aug. 18
Lithosia Aureola—July 5, P.H.M.

Stramineola—Sep. 8, N M.
Œnistis Quadra—Aug. 16, J.L.
Gnophria Rubricollis — June 26, C.E.P.C.
Arctia Caja—July 31, W.M.
Spilosoma Menthastri—May 21, N.M.
Lubricepeda—June 13, F.S.A.
Callimorpha Jacobææ — June 11, P.H.M.
Odonestis Potatoria—July 30, G.B.R.
Cilix Spinula—June 10, N.M.
Drepana Falcataria—May 30, F.S.A.
Hamula—June 6, N.M.
Unguicula—May 17, P.H.M.

NOCTUINA.

Thyatira Derasa—July 7, N.M.
Batis—July 25th, N.M.
Cymathophora Duplaris—June 30, N.M.
Bryophila Perla—August 3
Acronycta Psi—July 11, F.S.A.
Aceris—July 12, F.S A.
Rumicis—June 30, N.M.
Leucania Conigera—Aug 5, N.M.
Comma—July 5, N.M.
Pallens—July 25, N.M.
Xylophasia Rurea—June 30, N.M.
Lithoxylea—July 27, N.M.
Sublustris—Aug. 5, N.M.
Polyodon—June 30, N.
Hepatica—June 28, N.M.
Neuria Saponariæ—July 7, N.M.
Heliophobus Popularis—Sep. 6, N.M.
Luperina Testacea—May 3, P.H.M.
Mamestra Anceps—July 7, N.M.
Brassicæ—June 15, P.H.M.
Apamea Basilinea—June 30, N.M.
Gemina—June 20, N.M.
Miana Strigilis—June 28, N.M.
Grammesia Trilinea—June 28, N.M.
Rusina Tenebrosa—July 1, H.A.H.
Agrotis Suffusa—July — ? D.L.B.
Exclamationis—July 7
Triphœna Fimbria—Aug. 5, N.M.
Pronuba—June 7, N.M.
Noctua Augur—July 20, P.H.M.
Plecta—June 30, N.M.
C. Nigrum—July 7, N.M.
Triangulum—July 25, N.M.
Brunnea—July 15, F.S.A. (bred) July 25, N.M.
Festiva—June 28, N.M.
Bella—Sep. 6, N.M.
Tæniocampa Gothica—Ap. 18, N.M.
Rubricosa—Ap. 24, N.M.
Instabilis—Ap. 6, P.H.M.
Stabilis—Ap. 4, N.M.
Gracilis—Ap. 24, N.M.
Miniosa—Ap. 24, N.M.
Cruda—Ap. 24, N.M.
Cerastis Vaccinii—Ap. 4, N.M.
Dianthæcia Cucubali—June 19, P.H.M.
Miselia Oxyacanthæ—July — ? D L.B.
Phlogophora Meticulosa—July 1, H.A.H.
Euplexia Lucipara—June 30, N.M.
Aplecta Herbida—June 28, N.M.
Nebulosa—June 28, N.M.
Hadena Dentina—June 30, N.M.
Oleracea—July 4, G B.R.
Pisi—July 7, P.H.M.
Thalassina—June 30, N.M.
Xylocampa Lithorhiza—May 1, P.H.M.
Heliothis Marginata—July 5, N.M.
Brephos Parthenias—Ap. 3, N.M.
Notha—Mch. 19, N.M.
Plusia Chrysitis—July 18, P.H.M.
Gamma—May 30, P.H.M.
Gonoptera Libatrix—Mch. 5, W.M.

Euclidia Mi—June 4, P.H.M.
Glyphica—June 4, P.H.M.
Phytometra Ænea—June 4, P.H.M.
GEOMETRINA.
Ourapteryx Sambucaria—July 31, N.M.
Rumia Cratægata—May 19, N.M.
Metrocampa Margaritata—July 17, F.S.A. (bred).
Eurymene Dolobraria—June 30, P.H.M.
Selenia Illunaria—May 9, O.E.
Ennomos Tiliaria—Sep. 13, N.M.
Angularia—Sep. 22, P.H.M.
Amphidasis Prodromaria—May 16, P.H.M.
Hemerophila Abruptaria—May 30, N.M.
Boarmia Repandata—Aug. 18
Tephrosia Extersaria—June 26, F.S.A.
Nemoria Viridata—June 16, P.H.M.
Iodis VERNARIA—Aug. 6, N.M.
Lactearia—May 11, P.H M.
Ephyra Punctaria—June 6, P.H.M.
Trilinearia — May 29, N.M.; July 4, P.H.M.
Asthena Luteata—July 7, N.M.
Candidata—June 4, N.M.
Acidalia Trigeminata—Aug. 2, N.M.
Remutata—June 15, P.H.M.
Aversata—July 11, P.H.M.
Bradyepetes Amataria—Aug. 2.
Cabera Pusaria—May 30, P.H.M.
Exanthemata—June 15, P.H.M.
Corycia Punctata—June 10, N.M.
Taminata—May 19, P.H.M.
Halia Wavaria—Aug. 31, N.M. (bred)
Strenia Clathrata—June 4, P.H.M.
Lozogramma Petraria—May 19, P.H.M.
Numeria Pulveraria—June 15, P.H.M.
Fidonia Atomaria—June 16, H.A H.
Minoa Euphorbiata—June 21, P.H.M.
Abraxas Grossulariata—July 31, N M.
Ligdia Adustata—June 5, A.E.A.
Lomaspilis Marginata—May 24, F.S.A.
Hybernia Rupicapraria — Feb. 14, N.M.
Progemmaria—Mch. 19, Ap. 4, N M.
Anisopteryx Æscularia — Mch. 19, N.M.; Ap. 4, P.H.M.
Cheimatobia Brumata — Mch. 20, F.S.A.
Larentia Didymata—July 25, N.M.
Olivaria—June 17, N.M.
Eupithecia Centaureata — June 2, N.M.
Haworthiana—June 20, N.M.
Castigata—June 10, P.H.M.
Innotata—June 29, P.H.M.
Vulgata—May 19, N.M.
Abbreviata—June 10, N.M.
Rectangulata—July 7, P.H.M.
Lobophora Lobulata—May 16, P.H.M.
Thera Variata—June 10, N.M.
Ypsipetes Elutata—Aug. 2, N M.
Melanthia Ocellata—July 8, N.M.
Melanippe Rivata—May 29, N.M.; July 7, P.H.M.
Biriviata—May 27, P.H.M.
Montanata—June 9
Fluctuata—Ap. 6, P.H.M.
Antiolea Badiata—Ap. 4, N.M.
Derivata—May 13, N.M.
Coremia Munitata—June 1, P.H.M.
Propugnata—June 1, P.H.M.
Ferrugaria—May 24, F.S.A.
Unidentaria—May 28, N.M.
Comptogramma Bilineata—June 20,

P.H.M.
Cidaria Miata—June 8, P.H.M.
Picata—Aug. 1, N.M.
Corylata—June 16, P.H.M.
Russata—June 16, F.S.A.
Immanata—June 17, P.H.M.
Silaceata—July 4, P.H.M.
Prunata—Aug. 6, N.M.
Fulvata—Aug. 1, N.M.
Pyraliata—Aug. 6, N.M.
Dotata—July 30
Eubolia Mensuraria—Aug. 2, N.M.
Odezia Chærophyllata — June 29, P.H.M.

PYRALIDINA.

Hypena Proboscidalis — July 14, H.A.H.
Herminia Barbalis—June 24, F.S.A.
Tarsipennalis—July 31, N.M.
Nemoralis—July 8, P.H.M.
Hydrocampa Nymphæata—July 17, H.A.H.
Botys Urticata—June 25, P.H.M.
Ebulea Sambucalis—Aug. 6, N.M.
Pionea Forficalis—May 29, N.M.
Spilodes Cinctalis—June 16, P.H.M.
Scopula Olivalis—July 6, P.H.M.
Prunalis—Aug. 6, N.M.
Stenopteryx Hybridalis — June 8, P.H.M.
Nola Cristulalis—June 18, N.M.
Simæthis Fabriciana—May 23, N.M.
Eudorea Ambigualis—June 13, F.S.A.
Pyralella—June 10, N.M.
Aphomia Colonella—July 17, A.E.A.
Crambus Pratellus—July 16, P.H.M.
Chilo Forficellus—June 22, F.S.A.
Coleophora Prasinana — June 28, P.H.M.

TORTRICINA.

Eulia Ministrana—June 9, P.H.M.
Antithesia Pruniana — June 25, P.H.M.
Tortrix Ribeana—July 1, E G.W.
Ptycholoma Lecheana—June 19, N.M.
Pardia Tripunctana — June 16, P.H.M.
Spilonota Trimaculana — July 14, P.H.M.
Halonota Brunnichiana — June 19, N.M.
Coccyx Hyrciniana—July 4, P.H.M.
Anchylopera Lundana — May 28, N.M.
Argyrotoza Conwayana—June 25, P.H.M.
Roxana Arcuella—June 20, P.H.M.
Stigmonota Perlepidana—May 23, N.M.
Asthenia Splendidulana —Ap. 18, N.M.
Grapholita Ulicetana—May 21, N.M.
Sericoris Lacunana—July 5, P.H.M.
Argyrolepia Cnicana—July 7, N.M.
Tortricodes Hyemana — Mch. 19, N.M.

TINEINA.

Chimabacche Fagella—May 4, P.H.M.
Semioscopis Steinkellneriana—May 17, F.S.A.
Tinea Fulvimitrella—July 1, P.H.M.
Granella—June 17, P.H.M.
Lampronia Quadripunctella — May 28, N.M.
Incurvaria Masculella—May 30, P.H.M.
Nemophora Schwarziella—June 15, P.H.M.
Adela De Geerella—June 15, P.H.M.
Viridella—June 16, P.H.M.

Micropteryx Calthella—May 28, M.N.
Thunbergella—May 28, N.M.
Subpurpurella—May 21, P.H.M.
Plutella Cruciferarum—July 30
Depressaria Applana, Mch. 19, N.M.; June 16, P.H.M.
Dasycera Sulphurella—June 15, N.M.
Œcophora Pseudospretella—June 14, F.S.A.
Endrosis Fenestrella — June 9, P.H.M.
Antispila Pfeifferella—May 23, N.M.
Argyresthia Brockeella—July 4, P.H.M.
Oenerostoma Piniariella—May 23, N.M.
Gracilaria Swederella—May 23, N.M.
Syringella—June 18, N.M.
Ornix Avellanella—May 19, N.M.
Anglicella—May 5, N.M.
Lithocolletis Cramerella—May 23, N.M.
Spinolella—May 23, N.M.
Faginella—May 19, N.M.
Quercifoliella—May 23, N.M.
Nicellii—June 18, N.M.
Cemiostoma Laburnella—May 31, N.M.
Nepticula Floslactella—May 28, N.M.
Pterophorus Trigonodactylus—June 4, P.H.M.
Acanthodactylus — June 6, P.H.M.
Pentadactylus—July —, C.E.P.C.

COLEOPTERA.

The following species have been captured during the past year. Those whose names are in Italics are new to our list. Considering that no very special search was made for them, it is remarkable how many new species have been found; and it shows that our total List is far less complete than what it ought to be. If any Member of the Society would only work at this Order, he might make a grand name for himself.

Names of those whose initials occur in the following list:—

A.E.A....	...	...	A. E. Aldworth.
F.S.A. ...	...	...	F. S. Alston.
O.E. ...	...	...	O. Elton.
D.A.H....	...	...	D. A. Hailes.
H.A.H.	...	...	H. A. Hartley.
C.H.H....	...	...	C. H. Hooper.
P.H.M.	...	...	P. H. Maddock.
N.M. ...	...	...	N. Manders, Esq.
C.E.P.C.	...	...	C. E. Pine-Coffin.
H.D.R.	...	...	H. D. Rolleston.
P.A.S. ...	...	...	P. A. Sheppard.
E.G.W.	...	...	E. G. Waddilove.
S.B.W.	...	...	S. B. Wilson.

Cicindela campestris — May 25, P.H.M.
Notiophilus palustris—May 9, F.S.A.
biguttatus—May 3, O.E.
Nebria brevicollis—May 24, F.S.A.
Leistus ferrugineus—June 13, F.S.A.
Demetrias atricapillus—Feb. 17, F.S.A.
Loricera pilicornis—Mch. 6, F.S.A.
Chlænius nigricornis—May 21, F.S.A.
Calathus piceus—Feb. 17, D.A.H.
Anchomenus prasinus—May 3, O.E.
parumpunctatus—Feb. 8, F.S.A.
viduus—May 20, F.S.A.
Pterostichus nigrita—May 4, N.M.
madidus—Feb. 8, F.S.A.
Amara trivialis—May 4, N.M.
Harpalus ruficornis—June 4, A.E.A.
latus—May 25, F.S.A.
Bradycellus verbasci—May 13, F.S.A.
Trechus obtusus—Mch. 6, F.S.A.
Bembidium lampros—May 3, O.E.
Hydroporus planus—June 3, F.S.A.
Laccophilus minutus—June 3, F.S.A.
Agabus bipustulatus—June 3, F.S.A.
Hydrobius fuscipes—June 3, F.S.A.
Paracymus æneus—June 3, F.S.A.
Helophorus aquaticus—May 20, F.S.A.
granularis—June 3, F.S.A.
Spæridium bipustulatum — June 2, F.S.A.
Cercyon obsoletus—May 3, O.E.
lateralis—May 3, O.E.
melanocephalus—May 10, O.E.
Cryptopleurum atomarium—May 4, N.M.
Aleochara lata—May 6, O.E.
lanuginosa—May 10, O.E.
Myrmedonia canaliculata—May 30, F.S.A.
Homalota melanaria—May 10, O.E.
Tachyporus hypnorum — Feb. 8, F.S.A.
Tachinus rufipes—May 4, N.M.
subterraneus—Feb. 8, F.S.A.
Quedius fuliginosus—May 10, O.E.
Ocypus ater—July 3, F.S.A.
morio—May 6, O.E.
Philonthus *laminatus*—Feb. 8, F.S.A.
fimetarius—May 3, O.E.
nigritulus—May 4, N.M.
Paederus littoralis—May 4, N.M.
Stenus speculator—May 3, O.E.
Lesteva bicolor—May 27, F.S.A.
Anthobium ophthalmicum—July 15.
Megarthrus depressus — May 20, F.S.A.
Anisotoma calcarata—May 30, F.S.A.
Necrophorus humator — June 11, C.E.P.C.
Silpha rugosa—May 3, O.E.
sinuata—May 6, O.E.
atrata—Feb. 8, F.S.A.
Hister unicolor—June 5, F.S.A.
Epuræa æstiva—May 20, F.S.A.
Nitidula bipustulata—May 6, O.E.
Meligethes æneus—June 5, F.S.A.
picipes—May 4, N.M.
Dermestes murinus—May 6, O.E.
Attagenus pellio—May 20.
Byrrhus pilula—July 5, P.H.M.
Sinodendron cylindricum—July 15, F.S.A.
Aphodius hæmorrhoidalis—June 2, F.S.A.
fimetarius—May 10, O.E.
ater—May 4, N.M.
granarius—May 4, N.M.
merdarius—May 4, N.M.
punctato-sulcatus—June 2, F.S.A.
depressus—May 3, O.E.
Geotrupes stercorarius—March 30,

D.A.H.
Melolontha vulgaris—May 20, N.M.
Athous hæmorrhoidalis — June 5, C.E.P.C.
vittatus—June 8, P.H.M.
Corymbites bipustulatus — June 14, F.S.A.
Agriotes sobrinus—May 25, P.H.M.
pallidulus—June 7, F.S.A.
Dolopius marginatus —May 25, F.S.A.
Dascillus cervinus—July 18, P.H.M.
Lampyris noctiluca — Feb. 18, C.E.P.C.
Telephorus rusticus—July 3, F.S.A.
lividus—July 28, F.S.A.
pellucidus—July 1, H.A.H.
nigricans—June 14, F.S.A.
bicolor—June 4, P.H.M.
limbatus—June 13, F.S.A.
pallidus—June 4, F.S.A.
Malachius viridis—July 28, F.S.A.
Corynetes cæruleus—June 13, P.H.M.
violaceus—May 6, O.E.
Blaps mucronata—May 25, H.A.H.
Cistela murina—July 13, P.H.M.
Pyrochroa serraticornis—June 22, P.A.S.
Anaspis frontalis—July 28, F.S.A.
Meloe proscarabæus—May 15, E.G.W.
Otiorhynchus tenebricosus—May 10, F.S.A.
picipes—July 24, F.S.A.
sulcatus—May 21, F.S.A.
Barypeithes brunnipes—Feb.7, F.S.A.
Phyllobius alneti—June 18, F.S.A.
pyri—June 14, F.S.A.
argentatus—June 5, F.S.A.
oblongus—June 5, F.S.A.
uniformis—June 1, F.S.A.
Barynotus obscurus—May 6, O.E.
Strophosomus coryli—Feb.8, F.S.A.
Sitones lineatus—May 13, F.S.A.
Polydrusus undatus—May 20, F.S.A.
Hypera variabilis—May 4, N.M.
polygoni—June 6, P.H M.
Orchestes *quercus*—July 28, F.S A.
alni—May 19, H.D.R.
fagi—June 5, C.E.P.C.
stigma—May 20, F.S.A.
Cionus blattariæ—July 14, A.E.A.
Cœliodes quadrimaculatus — June 8, F.S.A.
fuliginosus—May 4, N.M.
Ceutorhynchus contractus—May 4, N.M.
Magdalinus atramentarius—July 28, F.S.A.
Apion craccæ—May 31, C.E.P.C.
striatum—June 5, F S.A.
flavipes—May 31, C.E.P.C.
miniatum—May 9, F.S.A.
Apoderus coryli—July 3, F.S.A.
Lema puncticollis—June 5, A.E A.
melanopa—June 5, F.S.A.
Crioceris asparagi—June 4, P.H.M.
Cryptocephalus aureolus — June 14, F.S.A.
Timarcha lævigata—Mch. 31, C.H.H.
coriaria—Feb. 18, F.S.A.
Chrysomela staphylæa—Jy. 3, F.S.A.
polita—May 20, N.M.
Gonioctena viminalis—June 18, N.M.
Gastrophysa polygoni — June 4, F.S.A.
Phædon tumidulum—May 24, F.S.A.
cochleariæ—May 19, N.M.
Phratora vitellinæ—June 17, N M.
Prasocuris marginella — May 31, C.E.P.C.
beccabungæ—May 31, C.E P.C.
Adimonia sanguinea—June 5, F.S.A.

Haltica pusilla—May 24, F.S.A.
Cassida rubiginosa—May 19, S.B.W.
Coccinella bipunctata — May 23, P.H.M.
17-punctata—Feb. 16, F.S.A.
variabilis—May 18, F.S.A.
16-guttata—June 14, F.S A.

BOTANICAL REPORT FOR 1879.

CONSIDERING the very unfavourable state of the weather throughout the year, the Botanical Report must be considered very satisfactory. Though the List of contributors is fairly long, it contains the names of a good many who are not Members of the School, consequently the work done by the School has not been great, though most of those whose names do appear have worked well. Aldworth has added a new species to our list, the Pyrenean Star of Bethlehem (*O. Pyrenaicum*), which occurs plentifully at Stype. Though said to be generally distributed over Wilts, it is not a common Plant, and is therefore a decided addition to our list. The Rev. J. Sowerby has also added a new species to our list, viz., *Silene anglica*, and has found a few new Localities for some of our more uncommon plants, and to him, as usual, our thanks are due for the full list of plants in flower during October, November, and December, involving much hard work and many miles walking.

The plan of printing the Botanical List, adopted last year, seems to have been approved of, and is therefore again adopted this year, and though taking up rather more room than the plan previously used, its greater advantage for working out results more than compensates for its increased length.

Flowering was very late this year, and though search was carried on till the middle of August, a few plants have escaped being recorded, not being in flower before that time; but taking it as a whole, the List is very complete, and the late notices obtained by Rev J. Sowerby make it especially valuable. Omitting the latter half of August and the first half of September, it may be considered as correctly exhibiting the state of the flowering of vegetation at Marlborough throughout the year.

The most marked feature of the year has been the dense foliage of the trees, but this, from the almost total absence of sunshine, has never ripened, and in consequence it remained on the trees for a very unusual time; at some places in England skating was enjoyed under Elm trees still with the foliage on, and as late as December 8th an Oak and an Elm still green (though with about half or two-thirds of leaves fallen) were still to be seen in the Forest. A remarkable proof of this was visible in the case of the Mulberry—as a rule, the first severe frost causes the whole mass of leaves to fall as soon as the sun shines on it. This year the first severe frost merely blackened the leaves at the ends of the branches and yet the trees continued green for some weeks afterwards. Another effect of the sunlessness of the year will probably result in a diminished fruit season next year, for the young shoots were unable to be properly ripened and consequently were

unable to resist the very severe weather experienced in the earlier part of December, and therefore perished in many instances.

The severe frosts in December 1878, culminating with that on Christmas Eve, killed down even the very commonest plant, so that on the 1st of January, no plant could be said to be really in flower, though occasionally a piece of Groundsel, Chickweed or of the two common Veronicas (*Polita* and *Buxbaumii*) might be found in very sheltered spots. The Primrose and Butcher's Broom seem also to have survived, as specimens were found before the end of the month. No species came into flower during the month.

At the beginning of February there was a warmer period than usual, and in this time five species came into flower, but before the end of the month the cold again returned and everything was checked. The Butter-bur which had managed to open a few flowers on the 15th was killed by the frost and a very poor specimen of the Celandine (*? Ficaria*) was found on the 25th. Snowdrops flowered in gardens on the 7th, (wild ones on the 9th), Daisies on the 8th, Hazel on the 10th, Dandelions on the 11th, Furze on the 12th, and in gardens the Aconite (*E. Hyemalis*) on the 9th and Crocus on the 12th, but of all these the Aconite alone was in full flower by the 28th.

March was still very cold and plants came very slowly into flower: many that had opened were much injured by the frost, especially the Yew and Hazel, large masses of the male Catkins of the latter being quite destroyed, and, as was proved subsequently, ruining the crop of Nuts. 20 plants came into flower during the month; the winter Aconite lasted till the 27th and Crocuses were in perfection on 31st.

The occurrence of the Easter Holidays in April would, in ordinary years, have seriously interfered with our notices, but the extreme backwardness of everything and the very slow progress made, enabled us to keep up a fairly continuous record. As instances of the very slow progress may be mentioned the Horse Chestnut, the buds of which were sticky on April 1st but were only opening on the 26th, though the trees were in leaf by April 30th. The Ash, again, had its stamens visible on April 5th, but the plant was not properly in flower by April 28th. The *Pyrus Japonica* was nearly out on April 8th, but the first flowers were not open till April 27th. Hedges were only slightly tinted by April 28th. During the month only 23 plants came into flower.

The temperature of May was still below the mean, and but very few plants had come into flower, only 48 since the beginning of the year, whereas in 1878 the number was 116, consequently though May was not a favourable month, still vegetation began to progress, and 153 plants came into flower, the greater portion during the last quarter of the month. Leafage progressed slowly at first, but during the last week the country generally assumed a less

wintry aspect and was fairly green by the 31st. Hedges were green on the 23rd at which time some few Oaks were in leaf—Limes were bursting their buds on the 12th and were tinted by the 17th, and Beeches were fairly green by the 20th. But the flowering of all shrubs and trees was very late. The Horse Chestnut had only one flower out on the 31st, the Ash was still in flower and the Hawthorn and Laburnum, though with coloured buds, had no flowers open by the end of the month.

Up to this time the rainfall (except in March, when it was much below the mean) had been heavy and roughly about 50 per cent. above the mean, but with June commenced a most deplorably damp period; for the next 3 months more than twice the average amount fell; in September there was a little above the average, and for the next 3 months, October, November, and December, a remarkably small amount, probably the smallest on record. In addition to this, the want of sunshine, which had been severely felt in the earlier months of the year, was now still more so. Provided we received our full amount of sunshine, there ought to be in June a quantity varying from 16·2 hours on 1st up to 16·8 hours on the 30th, in July from 16·5 hours to 15·4 hours, in August for 15·3 hours to 13·6, in September from 13 5 hours to 11·6 hours, in October from 11·6 hours to 9.7 hours, in November from 9·6 hours to 8·1 hours and in December from 8·1 hours to 7·8 hours; this year the amounts have been

	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Absolutely sunless days	2	3	5	4	13	13	17
No. of times less than 1 hour	3	6	4	6	4	2	4

and perhaps it may be more strikingly exemplified by saying that on no single day throughout the whole year have we had even the *minimum* amount of sunshine which might have been expected.

The effect on vegetation was that noticed at the commencement of these remarks, dense vegetation and no ripening of fruit or foliage or wood. Fruit growers know full well the utter failure of crops, if not in quantity, at least in quality, and farmers have had a very disastrous time of it. The dryness of the 3 last months (as regards rainfall) would have been greatly in their favour, but the utter sunlessness of the days prevented much of the low-lying land from becoming fit for ploughing, added to which the lateness of the crops prevented their getting on the land; corn not being cleared off many fields by October 9th.

The effect on our notices of wild flowers was, as might have been expected, a considerable retardation in the time of flowering, and considering the difficulty of procuring the notices, great credit is due to those members of the school who worked regularly. In June about 124 plants came into flower, in July 93, and in August as many as 52, which perhaps gives as good an idea of the

lateness of the season as any other fact which could be brought forward. The Ivy did not open a flower till October 17th and even then many buds were killed so that scarcely a single seed came to perfection. At Marlborough itself, no Ivy had opened a flower (as far as observed) till November 5th.

The duration of the flowers was equally remarkable, the number obtained during October was rather over 300, in November 206 were obtained, and even as late as December 8th upwards of 36 were gathered.

Most trees were defoliated by November 14th, but still many Oaks and Elms remained green, the latter not being generally defoliated till November 30th and December 1st, when a strong wind brought down most of the leaves. The Fig trees were defoliated on November 5th, the Mulberry November 14th, Limes were leafless November 1st, Ash still green November 1st, but leaves just falling. It was curious to observe how the leaves of many bushes though really dead, still remained green and adhering to the trees, and even as late as January 1st, 1880, green leaves could be found on the hedges. At the same time the Privet, Holly, and some other plants and trees, which may be considered to be evergreen shed their leaves abundantly, (these leaves still green), so much so, that some hedges of Privet were completely defoliated.

TABLE OF SUNSHINE AT GREENWICH.

	Total amount of sunshine due	Proper amount on 1st	Total amount actually received	Maximum amount received in one day	No. of absolutely sunless days	No. of days on which less than 1 hr's. sunshine
	hrs.	hrs.	hrs.	hrs.		
January	259·1	7·9	14·8	4·4	23	3
February	277 9	9.1	31·7	7·1	14	5
March	367·4	10·8	91·0	8·9	9	4
April	414·9	12·9	74·6	9 3	3	7
May	482·1	14·8	135·6	12·8	—	5
June	494·5	16·2	141·9	13·5	2	3
July	496.8	16·5	99·3	11.1	3	6
August	449·1	15·3	139·1	12·1	5	4
September	376·9	13·5	116·5	11·3	4	6
October	328·7	11·6	66·7	6·7	13	4
November	264·4	9 6	43·2	5·3	13	2
December	242·7	8·1	28·4	5 6	17	4

Names of those whose Initials occur in the following List:—

A.E.A.	A. E. Aldworth
F.S.A.	F. S. Alston
J.W.V.B.... ...	Rev. J. W. V. Baker
G.C.B.	Rev. G. C. Bell
C.E.C.	C. E. Cooper
H.J.C.	H. J. Cooper
G.W.D.L. ...	Rev. G. W. De Lisle
F.G.E.	F. G. Eyres
A.P.G.	A. P. Glyn
S.G D.	S. Grant-Dalton
K.G.	Miss K. Gwillim
D.A.H.	D. A. Hailes
J.J.H.	J. J. Hammond
H.A.H.	H. A. Hartley
C.H.	C. Hartley
C.H.H.	C. H. Hooper
H.R.H.	H. R. Hordern
H.B.H.	H. B. Herner Esq.
R.D.B.H. ...	R. D. B. Hovell
T.G.J.	T. G. Jnckes
J.L.	Sir John Lubbock, Bart., D.C.L., M.P.
W.H.M.	W. H. Macdonald, Esq.
P.H.M.	P. H. Maddock
N.M.	N. Manders, Esq.
W.M.H.M. ...	W. M. H. Milner, Esq.
C.E.P.C.	C. E. Pine-Coffin
M.P.	Miss]Preston
E.P.	Miss E. Preston
H.R.	H. Richardson, Esq.
P.A.S.	P. A. Sheppard
T.N.H.S.... ...	T. N. H. Smith, Esq.
J.S.	Rev. J. Sowerby
C.E.T.	Rev. C. E. Thorpe
E.G.W.	E. G. Waddilove

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
	Clematis												
	Vitalba									17			
	Thalictrum												
	majus						29	...	8				
	Anemone												
	nemorosa			19	...	...	4						
	Myosurus												
	minimus					*	...	2					
	Ranunculus												
C.H.	Flammula						21	...	...	...	...	...	8
	peltatus					10	...	11					
	floribundus								1	...	25		
G.W.D.L.	penicillatus				26	...	...	...	...	...	...	5	
	hederaceus											7	
	fluitans										...	8	
	auricomus				22	...	16			15	...	24	
	acris				*	4	...	...	...	...	...	...	8
	repens					20	...	...	...	...	...	...	8
	bulbosus				27	...	...	5		17	...	24	
	arvensis						16	...	14				
S.G.D.	Ficaria		*	1	...	...	18						
	Caltha												
D.A.H.,F.S.A.	palustris			6	...	...	21				18	...	1
	Helleborus												
	viridis			18	...	12							
	Aquilegia												
	vulgaris						9	...					
	Papaver												
J.J.E.,C.H.H.	Rhoeas						28	...	...	...	...	24	
P.H.M.	Lamottei						24	...					
	Lecoqii							8					
	Argemone										18		
	Chelidonium												
F.G.E.	majus					24	...	...	...	...	...	7	
	Fumaria												
F.G.E.	officinalis					24	...	...	...	...	18		
	Raphanus												
	Raphanistrum						13	...	...	...	...	...	8
	Sinapis												
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
	arvensis					29	...	...	...	...	...	...	8
	alba						13	...	...	...	...	13	
	Brassica												
	oleracea					24	...						
	Napus					22	...	...			...	24	
	Rutabaga					22	...	...					
	Diplotaxis												
	muralis								...	...	25		
	Sisymbrium												
F.S.A.	officinale						6	...	...	...	...	...	1
C.E.T.	Alliaria					5	...	...	2				
	Cardamine												
H.B.H.	pratensis				*26	...	28						
G.W.D.L.	hirsuta			21	...	31		*	*	*	14	24	
	sylvatica					12							
	Arabis												
J.J.H.	thaliana					...							
C.E.T.	hirsuta				29	...	...	13					
	Barbarea												
C.E.T.	vulgaris					12	28	*					
	Nasturtium												
	officinale						19	...	...	...	...	5	
	Armoracia												
	rusticana							...					
	Draba												
	verna				25	...	28						
	Thlaspi												
H.A.H.	arvense					29	...	24					
	Capsella												
	Bursa-pastoris					31	...	...	...	...	...	...	8
	Lepidium												
C.E.P.C.	campestre						...	...	...	...	...	24	
	Senebiera												
	coronopus						13	...	...	...	...	13	
	Reseda												
	lutea										29		
N.M.	luteola							16	...	...	15		
	Helianthemum												
H.A.H.,P.H.M.	vulgare						15	...	...	...	...	24	
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
	Viola												
Mr. Coleman	odorata			16	...	16							
A.E.A.	hirta			30	...	20							
	Riviniana				20	...	2	*	5	...	17		
	Reichenbachiana					10							
G.W.D.L.	canina					24							
H.A.H.	tricolor						16	...	...	17			
	arvensis				27	...	...	...	...	...	...	24	
	Polygala												
	vulgaris						13	...	...	...	...	17	
H.A.H.	calcarea					18	...	22		*			
	Silene												
P.H.M.	inflata						25	...	...	17			
	noctiflora										18		
J.S.	anglica										...	18	
	Lychnis												
M.P.	vespertina						15	...	...	...	18		
F.S.A.	diurna					22	...	...	...	...	...	17	
	Flos-cuculi						17	...	12				
	Moenchia												
G.W.D.L.	erecta					24	...						
	Cerastium												
F.S.A.	glomeratum					24	...	...	...	...	...	24	
	triviale				8	...	...	...	...	...	...	...	8
	Stellaria												
	media	...	...	...	...	...	...	...	...	...	...	...	8
C.E.T.	Holostea					6	...	...	12				
F.S.A.	graminea						27	...	...	...	...	...	1
P.A.S.	uliginosa					31							
	Arenaria												
	trinervis					29	...	15				*	
	serpyllifolia					*	15	...	...	...	...	24	
	Sagina												
	apetala								...	...	13		
	procumbens					30	...	...	...	17		*	
J.L.	nodosa								15				
	Spergala												
	arvensis							11	...	...	...	24	
	Spergularia												
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
	rubra										15		
	Scleranthus												
	annuus										...	...	8
	Montia												
P.H.M.	fontana					...	...						
	Hypericum												
	perforatum								2	...	...	8	
	tetrapterum								2	14			
	pulchrum								2				
	hirsutum							28	...	...	18		
	Malva												
G.W.D.L.	moschata							18	...	...	...	...	1
F.S.A.	sylvestris						24	...	...	...	...	18	
	rotundifolia							5	...	...	...	...	8
	Tilia												
	intermedia							29	12				
	Linum												
F.S.A.	catharticum						13	...	...	...	...	17	
	usitatissimum										...		
	Geranium												
cult.	Phœum						6	...	24				
H.A.H.	pratense						19	...	...	...	29		
A.E.A.	pyrenaicum						3	...	...	...	14		
F.G.E.	molle					*	8	...	...	...	...	14	
cult.	rotundifolium									...			
F.S.A.	dissectum						4	...	...	...	...	24	
P.H.M.	columbinum						25	...	...	...	...	20	
	lucidum					24	...	...	...	...	18		
C.E.T.	Robertianum					25	...	...	...	...	...	18	
	Erodium												
T.N.H.S.	cicutarium					29	...						
	Oxalis												
W.H.M.	Acetosella					1	2						
	Ilex												
A.E.A.	Aquifolium						5	6					
	Euonymus												
P.H.M.	europæus						14	15					
	Rhamnus												
P.H.M.	catharticus						27	6					
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
	Acer												
F.S.A.	Pseudo-Platanus					17	28						
	campestre					25	21						
	Ulex												
	europæus		12	...	...	...	...	11	*			3	8
	Gallii											24	...
	Genista												
	anglica						...						
cult.	tinctoria								11				
	Sarothamnus												
F.S.A.	Scoparius					18	8						
	Ononis												
	arvensis								11				
	Anthyllis												
H.A.H.	vulneraria						15	...	...	...	...	...	8
	Medicago												
	lupulina					18	...	...	...	...	...	...	1
	Melilotus												
	officinalis							...					
	Trifolium												
	pratense					20	...	..	...	...	...	24	
	medium								11				
A.E.A.	incarnatum					31	...	...	11				
	arvense										...	...	8
	hybridum							24	...	...	...	10	
H.A.H.	repens						16	...	...	...	...	3	
	procumbens							3	...	...	...	...	8
P.A.S.,A.E.A.	minus					31	...	...	...	...	...	24	
	Lotus												
P.H.M.	corniculatus						4	...	...	17			
	major								11	...	18		
	Hippocrepis												
	comosa						11	24					
	Onobrychis												
D.A.H.	sativa						13	...	11				
	Vicia												
C.E.P.C.	hirsuta						17	...	...	...	...	...	1
	tetrasperma							5	...	...	...	17	
H.A.H.	Cracca							17	11				
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
N.M.	sylvatica							8	...	...	...	13	
	sepium					20	...	...	...	...	...	24	
D.A.H.	sativa						22	...	13				
W.M.H.M.	angustifolia					29	...	...	...	...	17		
	Lathyrus												
	Aphaca										...	5	
P.H.M.	pratensis						15	...	...	...	...	5	
	Orobus												
P.H.M.	tuberosus					18	...	...	...	17			
	Prunus												
E.G.W.	spinosa					5	2						
N.M.	Avium					5,30							
	Spiræa												
	Ulmaria							1	...	...	...	...	1
J.J.H.	Filipendula							16	...	...	...	5	
	Agrimonia												
F.S.A.	Eupatoria						*	18	...	...	...	24	
	odorata								11	17			
	Sanguisorba												
cult.	officinalis							25	...				
	Poterium												
	sanguisorba					20	...	...	...	...	...	24	
	Alchemilla												
A.E.A.	arvensis					24	...	...	...	...	...	24	
	vulgaris					10	2				13	24	
	Potentilla												
	Fragariastrum			7	...	...	13				21	...	8
J.W.V.B,F.S.A.	Tormentilla					24	...	...	...	...	...	...	8
	reptans							5	...	...	29		
G.W.D.L.	anserina					29	...	...	12				
	Fragaria												
C.E.T.	vesca					9	...	...	12		*		
	Rubus												
H.A.H.	Idæus						16	11					
	discolor								13	...	...	13	
M.P.	cæsius						16	...	...	...	...	24	
	Geum												
F.S.A.	urbanum						6	...	...	...	...	24	
F.T.	intermedium					30	15				...	24	
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
	Rosa												
	tomentosa							1					
P.H M.	canina							1	18				
	arvensis							15	13	*	*		
	Cratægus												
P.H.M.,A.E.A.	oxyacantha						4	15					
	Pyrus												
H.R.H.	malus					29	...						
	Epilobium												
H.R.	angustifolium							11	...				
	hirsutum								2	14			
	parviflorum							21	...	...	11		
F.S.A.	montanum						27	...	...	...	...	24	
	tetragonum									...	.	.	
	palustre							17	...	...	...	17	
	Circæa												
	lutetiana							17	...	14			
	Callitriche												
	verna					22	...	...	...	14			
	platycarpa								2				
	Bryonia												
P H.M.	dioica						20	...	11				
	Ribes												
	Grossularia				8	...	2						
C.E.T.	rubrum					1							
	Sedum												
	album								11				
D.A.H.	acre							9	11				
	reflexum							15	...	...	14		
	Sempervivum												
	tectorum							9					
	Saxifraga												
C.E.T.	tridactylites				29	...	...	24					
	granulata					18	16						
	Chrysosplenium												
A.E.A.	oppositifolium					...							
	Sanicula												
A.E.A.	europæa					31	...	10					
	Heliosciadium												
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
	nodiflorum							15	...	...	...	5	
	inundatum							11					
	Ægopodium												
	Podagraria						26	15					
	Bunium												
A.E.A.	flexuosum						8	24					
	Pimpinella												
	Saxifraga							24	...	...	...	...	1
	Sium												
	angustifolium								2	...	13		
	Œnanthe												
cult.	fistulosa							14	...				
F.S.A.	crocata						15	21					
	Æthusa												
	Cynapium							19	...	...	...	17	
	Silaus												
	pratensis							1	...	...	15		
	Angelica												
	sylvestris								2	...	...	24	
	Pastinaca												
P.A.S.	sativa						*	18	...	...	...	...	8
	Heracleum												
A.E.A.	Sphondylium					*	14	...	...	...	...	17	
	Daucus												
H.A.H.	Carota							23	...	...	...	...	1
	Torilis												
	infesta									17	...	10	
	anthriscus							23	...	...	...	5	
	Chærophyllum												
	sylvestre				*	5	...	...	11		21	17	
	temulum						13	...	...	...	...	5	
	Scandix												
T.N.H.S.	Pecten-Veneris						11	...	...	...	...	...	8
	Conium												
	maculatum							17	...				
	Hedera												
G.S.	Helix										17	...	8
	Cornus												
	sanguinea							8	12				
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
	Adoxa												
E.G.W.	Moschatellina			12	...	...	2						
	Sambucus												
	nigra						23	...	...				
	Ebulus							...	...				
	Viburnum												
J.J.H.	opulus						15	15					
C.E.T.	Lantana					16	21				*		
	Lonicera												
	Periclymenum							19	...	17			
	Galium												
D.A.H.	cruciatum					10	...	11					
G.W.D.L.	verum							14	...	...	18		
P.A.S.	Mollugo						*	14	...	...	25		
C.H.H.	saxatile						14						
	palustre						*	5	...	...	15		
	uliginosum							13					
A.E.A.	Aparine					29	...	...	...	...	...	24	
	tricorne						23	...	...				
	Asperula												
F.G.E.	odorata					22	...	24					
C.E.P.C.	Cynanchica						*	8	...	14			
	Sherardia												
A.P.G.	arvensis					*	*	15	...	...	...	7	
	Valeriana												
F.G.E.	dioica					21	21	*					
	officinalis							3	...				
	Valerianella												
	olitoria					19	...	...		...			
	Auricula							5	...				
	dentata					27	...			...	...		
	Dipsacus												
	sylvestris								9	...	...	5	
	pilosus									13	17		
	Scabiosa												
	succisa								2	...	...	17	
	columbaria							*	2	...	...	24	
	arvensis							5	...	...	...	...	1
	Carduus												
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
P.H.M.	nutans						28	...	...	...	...	5	
	crispus						*		11	...	...	7	
	lanceolatus							23	...	...	...	7	
F.S.A.	palustris						21	...	...	...	...	24	
	tuberosus							...					
	acaulis								11	...	29		
	arvensis							22	...	...	25		
	Arctium												
	majus									14	17		
J.L.	intermedium								15	...	14		
	nemorosum									14	29		
	Serratula												
J.L.	tinctoria								14	...	...	5	
	Centaurea												
	nigra							23	...	...	...	24	
H.A.H.	Scabiosa							23	...	...	...	...	1
	Cyanus										...	3	
	Chrysanthemum												
	segetum										...	...	8
A.E.A.	Leucanthemum						8	...	...	...	...	24	
	Matricaria												
A.E.A.	inodora					*	*	15	...	...	...	...	8
	Tanacetum												
	vulgare											29	
	Anthemis												
	cotula							5	...	...	...	24	
P.A.S.	arvensis					...		...					
	Achillæa												
P.H.M.	millefolium						25	...	...	...	...	...	8
	Ptarmica								...				
	Artemisia												
	vulgaris								10	...	18		
	Filago												
	germanica											29	
	Gnaphalium												
	uliginosum										29		
	sylvaticum										...	17	
	Senecio												
	vulgaris	...	...	...	...	...	...	...	...	...	...	...	...
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
	sylvaticus										...	24	
	erucifolius										...		
D.A.H.	Jacobæa							13	...	...	...	...	1
	aquaticus							10	...	...	...	20	
	Bidens												
	tripartita										...		
	Inula												
	Conyza										..	5	
	Bellis												
N.M.	perennis		8	...	...	...	...	...	..	...	...	...	1
	Erigeron												
	acris						27	...	..	...	...	9	
	Solidago												
	Virga-aurea									13	29		
	Tussilago												
F.S.A.	Farfara			2	...	...	2						
	Petasites												
T.G.J.	vulgaris		15	...	...	20							
	Eupatorium												
	cannabinum								1	...	14		
	Cichorium												
	Intybus										...		
	Lapsana												
	communis							5	...	...	...	...	8
	Hypochœris												
F.S.A.	radicata						16	...	...	...	...	...	1
	Leontodon												
	hirtus							9	...	...	...	7	
H.A.H.	hispidus						13	...	...	...	...	13	
	autumnalis							8	...	...	...	...	1
	Picris												
	hieracioides								10	...	...	...	1
	Helminthia												
	echioides										...	17	
	Tragopogon												
	pratensis					29	...	...	...	...	...	3	
	Taraxacum												
	officinale		11	...	...	...	...	...	...	...	...	...	8
	Sonchus												
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
	oleraceus							...	...	...	...	24	
F.S.A.	asper						24	...	...	...	...	...	8
	arvensis								2	...	29		
	Crepis												
	virens						29	...	...	...	...	...	1
	Hieracium												
D.A.H.	Pilosella						8	...	...	...	17		
	vulgatum							5	...	...	...	17	
	boreale									...	...	10	
	Phyteuma												
	orbiculare								10	...	18		
	Campanula												
H.R.	glomerata							*	2	...	...	24	
	Trachelium								11	...	18		
D.A.H.	rotundifolia							21	...	...	...	24	
	Specularia												
	hybrida										18		
	Calluna												
	vulgaris										...	10	
	Fraxinus												
	excelsior				8	31							
	Ligustrum												
H.A.H.	vulgare							10	...				
	Vinca												
A.E.A.	major					9	28						
	minor				27	...							
	Erythræa												
	Centaurium								2	...	...	12	
	Gentiana												
	Amarella									14	13		
	campestris										13		
	Menyanthes												
	trifoliata					26	21						
	Convolvulus												
	arvensis							23	...	...	17		
	sepium								10	...	14		
	Solanum												
P.H.M.	Dulcamara						28	...	...				
	Verbascum												
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
D.A.H.	Thapsus							25	...				
	nigrum									14	...	8	
	Scrophularia												
	Balbisii						28	...	...	...	...	5	
	nodosa						27	...	...	...	...	20	
	Linaria												
	Cymbalaria					6	...	...	...	...	...	...	1
	Elatine										...	24	
	spuria										...	5	
A.E.A.	vulgaris						*		2	...	29		
D.A.H.	minor							13	...	...	18		
	Veronica												
	hederifolia			7	...	...	...	...	2	14	...	...	8
	polita	...	...	...	...	...	...	...	...	...	...	24	
F.S.A.	agrestis					24	...						
	Buxbaumii	...	...	...	...	...	...	...	...	...	...	...	8
	arvensis					16	...	...	...	...	...	...	8
C.E.T.	serpyllifolia				29	...	15				...	...	8
C.H.H.	officinalis						16	...	...				
	Chamædrys					9	...	...	...	.	25		
W.M.H.M.	montana					31							
E.P.	scutellata							19					
	Anagallis						19	...	...	...	...	5	
	Beccabunga					29	...	...	...	...	8		
	Euphrasia												
C.H.H.	officinalis						16	...	...	...	17		
	Bartsia												
	Odontites							14	...	...	18		
	Pedicularis												
H.A.H.	sylvatica					24	16			30			
	Rhinanthus												
	Crista-galli					30	...	...					
	Melampyrum												
F.S.A.	pratense						14	.	...	17			
	Lathræa												
F.T.	squamaria				26	...							
	Orobanche												
	elatior								...				
G.W.D.L.	minor							9					
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
	Lycopus												
	Europæus									...			
	Mentha												
	hirsuta									14	17		
	arvensis								10	...	14		
	Thymus												
D.A.H.	Serpyllum						16	...	...	...	...	10	
	Origanum												
	vulgare										29		
	Calamintha												
	Clinopodium								8	...	...	10	
	Acinos							30	...	...	15		
	menthifolia									...	17		
	Nepeta												
	Cataria										18		
H.B.H.,N.M.	Glechoma				8	...	...	...	12				
	Salvia												
	Verbenaca					29	...	...	...	...	...	5	
	Prunella												
F.S.A.	vulgaris						21	...	...	...	...	5	
	Scutellaria												
	galericulata							19	...	...	15		
	Ballota												
K.G.	nigra								6	...	...	5	
	Stachys												
	Betonica							22	...	..	...	17	
	palustris								2	...	17		
P.A.S.	sylvatica						28	...	...	...	...	13	
	Galeopsis												
	Ladanum								11	...	...	5	
	Tetrahit							10	...	...	...	24	
	Lamium												
A.E.A.	amplexicaule						8	...			13		
	purpureum	...	...	...	...	...	...	...	..	...	...	...	1
	album				26	...	...	...	...	...	...	24	
G.W.D.L.	Galeobdolon					16	28						
	Ajuga												
D.A.H.	reptans					18	...	...	...	...	...	17	
	Teucrium												
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
	Scorodonia										...	17	
	Lithospermum												
D.A.H.	officinale						26	...	...	...	...	...	1
	arvense					*	14	...	...	...	...	7	
	Myosotis												
H.A.H.	palustris						17	...	...	...	...	7	
H.A.H.	arvensis					18	...	...	...	...	...	13	
	collina					14	...						
	versicolor					...	...	...	2				
	Anchusa												
H.A.H.	arvensis					31	...	...	...	...	...	13	
	Symphytum												
	officinale					13	...	...	...	...	...	13	
	asperrimum										...	20	
	Cynoglossum												
G.W.D.L.	officinale						12	5		30	15		
	Primula												
	vulgaris	...	...	...	...	...	16	*		13	...	...	8
	officinalis				26	...	17						
	Lysimachia												
cult.	nummularia							17	...	17			
	nemorum						9	...	...	...	21		
	Anagallis												
R.D.B.H.	arvensis						28	...	...	...	...	13	
	Plantago												
H.A.H.	major						22	...	...	17			
S.G.D.	media						13	...	...	...	18		
C.E.T.	lanceolata					5	...	...	...	...	...	...	8
	Chenopodium												
	album								15	...	...	3	
	B. Henricus					23	...	...	...	...	14		
	Atriplex												
	angustifolia							23	...	...	18		
	Rumex												
	conglomeratus							23	...	...	...	13	
	nemorosus							10	...	17			
	obtusifolius						13	...	...	...	...	13	
	crispus							5	...	...	...	24	
	Hydrolapathum							23	...	17			
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
F.G.E.	Acetosa					29	28						
A.E.A.	Acetosella					24	...	...	...	...	...	17	
	Polygonum												
	Convolvulus							1	...	...	...	17	
	aviculare							10	...	...	...	...	8
	Hydropiper									14	...	17	
	Persicaria								2	...	...	13	
	lapathifolium								2	17			
	amphibium								2	14			
H.J.C.	Bistorta					30	...	10					
	Daphne												
	Laureola			6	...	31							
	Buxus												
	sempervirens					...	2						
	Euphorbia												
	Helioscopia								2	...	...	24	
F.S.A.	amygdaloides					20	...	...	...	...	...	5	
	Peplus						22	...	...	...	...	...	1
	exigua							15	...	...	...	17	
	Mercurialis												
E.G.W.	perennis			10	...	...	20				17	5	
	Urtica												
P.H.M.	dioica						13	...	...	17			
	urens					31	...	...	...	...	...	13	
	Ulmus												
	suberosa				1								
	montana			20	26								
	Quercus												
	Robur					30	13						
	Fagus												
P.H.M.	sylvatica					27	...						
	Corylus												
E.G.W.	Avellana		10	...	...	17							
	Carpinus												
	Betulus					6							
	Betula												
P.H.M.	alba					12							
	Populus												
	nigra				...	...							
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
	Salix												
F.G.E.	fragilis					22							
	alba					...							
	triandra				5	...	21						
F.S.A.	viminalis			20	...	2							
A.E.A.	caprea			17	...	12							
	Pinues												
H.A.H.	sylvestris						16						
	Taxus												
E.G.W.	baccata			9	8								
	Sparganium												
A.E.A.	ramosum						28	...	...				
	simplex								2				
	Arum												
P.H.M.	maculatum					13	16						
	Potamogeton												
C.E.P.C.	natans								2				
	densus						13						
	Triglochin												
F.S.A.	palustre						21						
	Alisma												
	Plantago								2				
	Butomus												
	umbellatus									14			
G.W.D.L.	Orchis												
	pyramidalis								3				
	ustulata							16					
	Morio						10	16					
	mascula						10	28					
W.M.H.M.	incarnata							2	1				
	latifolia							21	19				
	maculata							16	12				
	Gymnadenia												
	conopsea							27	11				
	Habenaria												
H.J.C.	chlorantha							14	5				
	Herminium												
	monorchis												
	Ophrys												
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
G.W.D.L.	• apifera							14					
	Spiranthes												
J.S.	autumnalis										13		
	Listera												
	ovata						*	11	...	14			
	Neottia												
P.H.M.	Nidus-avis						30	...					
	Epipactis												
cult.	latifolia									13			
	Cephalanthera												
	grandiflora									...			
	Iris												
cult.	foetidissima							23					
C.E.T.	Pseud-acorus						16	24					
	Narcissus												
E.G.W.	Pseudo-Narcissus			16	...	12							
	Galanthus												
	nivalis		9	...	8								
	Tamus												
H.A.H	communis						25	...	2				
	Polygonatum												
F.G.E.	multiflorum					*	14						
	Ruscus												
	aculeatus	...	...	...	...	...	16						
	Tulipa												
	sylvestris					14							
	Ornithogalum												
C.H.H.	umbellatum						12						
A.E.A.	pyrenaicum							1	...				
	Scilla												
N.M.	nutans					5	28						
	Allium												
	ursinum					31							
	Colchium												
	autumnale									14	...	17	
	Luzula												
	pilosa				5	...	2						
	campestris				25	...	2						
	Juncus												
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

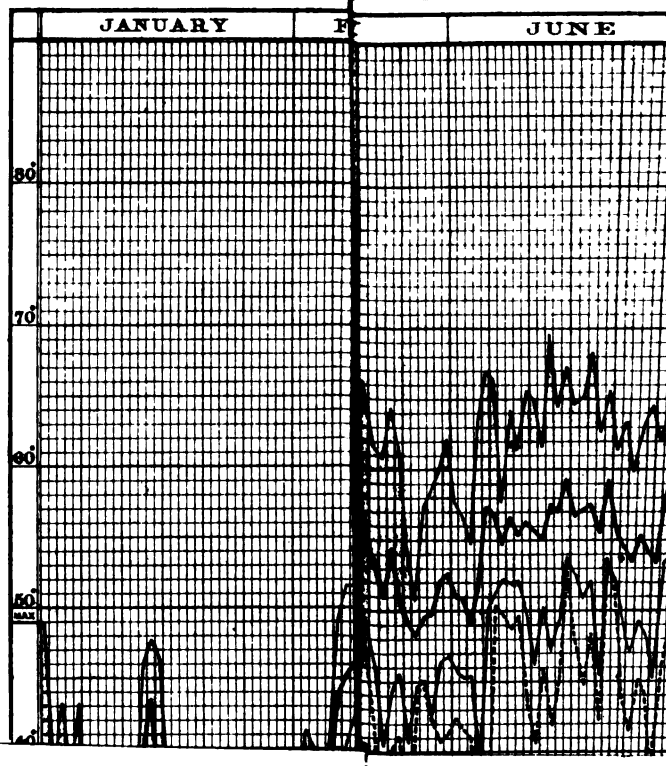
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
	conglomeratus								11				
	effusus								11				
	glaucus								2				
	lamprocarpus							24	...	...	13		
	bufonius							10	...	...	...	17	
	Scirpus												
	palustris						14	...	2				
	lacustris							5					
	Carex												
W.M.H.M.	disticha						2						
A.E.A.	paniculata					31	...						
	vulpina						26						
	muricata					24	...	5					
	acuta					30	15						
	glauca					12	15						
C.E.T.	præcox					3							
	pendula						...						
A.E.A.	sylvatica					24	15						
	hirta					28	14						
C.E.C.	paludosa					20	20						
F.G.E.	riparia					22	20						
T.N.H.S.	vesicaria					...							
	Anthoxanthum												
	odoratum					9	...	...	...	...	...	7	
	Digraphis												
H.A.H.	arundinacea						21	...	...	...		7	
	Phalaris												
	canariensis							15	...	...	17		
	Alopecurus												
F.S A.	agrestis					29	...	...	...	...	...	...	8
W.M.H.M.	geniculatus					29	...	...	1				
	pratense				27	...	...	...	...		*	*	
	Phleum												
H.A.H.	pratensis						16	...	...	...	...	24	
	nodosum							11					
	Agrostis												
	alba							15					
	vulgaris						28	...	...	...	...	7	
	Phragmites												
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
	communis								...	17			
	Milium												
	effusum					29	...	...	...				
	Aira												
H.A.H.	cæspitosa						19	...	...	...	...	20	
	flexuosa							...	...	...	...	17	
	Avena												
	flavescens						13	...	...	...	...	20	
	pubescens					20	24						
	pratensis					29	24						
P.A.S.	elatior						13	...	...	...	...	...	1
	Holcus												
P.A.S.	mollis						28	...	...	...	...	13	
	lanatus					24	...	...	...	...	..	24	
	Koeleria												
	cristata						13	15					
	Melica												
	uniflora					29	...	24					
	Glyceria												
	fluitans						*	15	...				
	plicata						13	...	...	...	...	1	7
	aquatica						28	...	...	17			
	Poa												
	annua				27	...	...	...	...	...	...	...	8
	compressa							5	...	15			
	pratensis					9	...	...	2				
	trivialis					31	...	...	...	...	...	20	
	Briza												
P.H.M.	media						13	...	12				
	Cynosurus												
P.H.M.	cristatus						13	...	...	...	...	17	
	Dactylis												
F.S.A.	glomerata					24	...	...	...	...	...	24	
	Festuca												
	sciuroides							...					
	ovina					*	13	24					
	rubra					29	...	...	2				
	elatior								2				
	pratensis						13	...	...				
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
	loliacea							1					
	Bromus												
	giganteus							15	...	...	...	...	8
	asper						14	...	...	...	...	...	1
	erectus					20	...	...	15				
	sterilis					18	...	...	...	...	...	24	
	racemosus					29	...	...	...	...	...	10	
	commutatus							10	...	14			
	mollis					8	...	...	...	...	...	13	
	Brachypodium												
	sylvaticum							5	...	...	...	24	
	Triticum												
	caninum							5	...	...	17		
	repens						21	...	...	...	...	24	
	Lolium												
	perenne					27	...	...	...	...	...	24	
	Italicum							8	...	...	...	17	
	Hordeum												
	pratense							21	...	...	18		
	Ophioglossum												
	vulgatum					24	...	11					
	Botrychium												
P.H.M	lunaria					21							
	Equisetum												
C.E.T.	arvense				28	...	...						
	palustre					29							
A.E.A.	limosum						21	...	...	...	17		

	Corydalis												
G.C.B.	solida			31									
	Aubrietia												
G.W.D.L.	purpurea			21									
	Ribes												
	sanguineum				8								
	Staphylea												
	pinnata					29							
	Cornus												
	mascula			16									
		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.

		J.	F.	M.	A.	My.	J.	Jy.	A.	S.	O.	N.	D.
	Lonicera												
H.A.H.	caprifolium						28						
	Syringa												
	vulgaris (Lilac)					29							
	Larix												
F.S.A.	Europæa				1								
	Scilla												
	siberica			11									
A.E.A.	Rye						8						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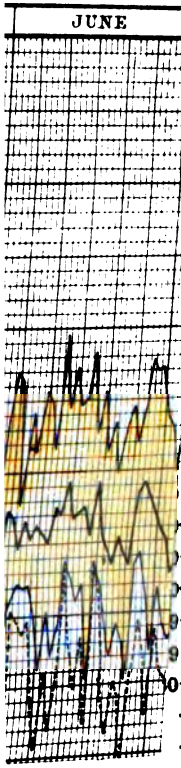


of r d a.	Temperature. In the Shade: Highest.	Lowest	Adopted Mean.	Dew Point.	Highst insun's rays	Lowst. on the grass	Wind. Direction. A.M.	P.M	Velocity. Miles.	Mean amt. of Cloud (0-10).	Rain.
	°	°	°	°	°	°					in.
56	49·0	33·0	39·9	36·9	49·0	32·1	W.	E.	238	9·5	1·46
85	38·4	24·1	29·2	25·3	83·0	·19·	N.	N.W.	184	5·5	·72
06	43·2	30·2	36·5	36·0	43·0	27·6	W.	N.W.	67	10·0	·10
26	38·2	25·2	30·3	27·4	79·5	23·7	N.W.	W.	53	0·0	
190	43·1	20·2	27·2	22·8	75·0	17·4	W.	W.	29	0·5	
876	31·0	17·5	24·3	23·3	38·5	15·3	W.	E.	35	5·0	·05
927	35·0	26·1	29·4	27·9	41·5	27·1	E.	E.	194	10·0	·15
697	31·3	24·9	27·1	21·0	65·0	22·6	E.	N.E.	291	9·5	
011	32·6	22·5	26·6	17·3	61·5	14·7	N.E.	N.E.	157	4·5	
663	25·8	17·1	20·8	14·1	45·6	9·0	E.	N.E.	110	5·0	
706	25·0	16·1	20·4	18·2	48·7	9·4	N.	N.E.	79	5·0	
141	34·0	14·7	24·7	23·1	75·0	7.1	N.W.	N.W.	98	5·5	·14
135	45·9	33·1	40·1	39·9	54·8	29·6	S.W.	S.W.	192	10·0	·04
778	47·6	38·2	43·6	43·2	49·0	31·5	S.	S.W.	136	10·0	·73
9 840	46·5	32·0	37·5	34·1	83·6	22·2	S.	S.W.	325	10·0	
0·006	38·9	28·1	32·6	28·9	50·1	20·5	E.	E.	105	5·0	
·206	35·2	25·3	30·6	30·1	36·2	20·5	E.	E.	65	10·0	·42
·011	40·0	32·7	35·5	34·0	46·1	32·2	E.	E.	176	10·0	·13
·355	34·7	29·0	31·3	29·3	53·0	24·5	N.E	E.	51	10·0	
30·136	31·3	27·4	28·8	24·5	36·3	22·4	E.	E.	102	5·5	
29 953	29·1	25·1	27·0	23·4	52·3	25·9	E.	N.E.	63	9.5	
30·059	30·0	23·3	25·8	18·5	55·9	19·6	N.E.	N.E.	199	4·5	
·036	29·9	21·9	26·1	16·1	72·9	17·9	N.E.	N.E.	305	9·0	
·051	30·5	27·0	28·4	16·0	40·0	25·9	N.E.	N.E.	180	10·0	
·116	31·2	27·0	29·2	24·8	38·1	26·9	N.E.	E.	198	10·0	
·245	35·0	30·3	32·1	29·8	55·0	30·2	E.	N.E.	119	10·0	
·432	33·9	31·6	32·4	29·7	39·0	31·3	N.E.	N.E.	*	10·0	.03
·336	32·4	30·0	30·8	26·6	35·1	29·3	N.E.	N.E.	*	10·0	
·282	33·0	28·4	30·4	28·5	37·0	28·4	N.E.	N.E.	*	10·0	
·320	32·9	30·2	31·1	27·1	33·2	29·6	N.E.	N.E.	*	10·0	
30·270	32·1	28·3	29·6	20·7	33·0	28·4	E.	N.E.	136	10·0	·04
30·045	35·4	26·5	30·3	26·4	51·8	23·3	...	...	...	7·9	4·01

* Anemometer frozen.

FEBRUARY, 1879.

Days of Month.	Mean Readg of Baromtr. reduced To sea Leavel.	Temperature. In the Shade. Highest.	Lowest	Adopted Mean.	Dew Point.	Highst insun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0..10)	Rain.
	ins.	°	°	°	°	°	°					in.
1	29·978	30·8	25·4	28 0	25·1	45·6	26·5	N.E.	E.	205	10·0	·17
2	·725	41·4	29·9	36·0	35 8	46·0	30·2	E.	E.	155	10·0	·09
3	29·674	40·1	32·2	35·5	33·8	45 0	32·2	N.E.	N.E.	151	10·0	·14
4	30·032	36·1	31·7	33·2	28·5	58·5	30·9	N.E.	E.	114	9 5	
5	29 813	40·8	31·7	36·5	34·4	45·5	30·7	S.	S.W.	146	10·0	·25
6	·590	49·5	38·7	43 9	41·4	63·3	32 0	S.W.	S.W.	485	9 5	·27
7	·326	51·7	40·4	45·6	43·7	68·2	34·1	S.W.	S.W.	525	10.0	·41
8	·536	51·7	42·5	46 2	43·4	90 0	39·6	S.W.	S.W.	557	9 5	·65
9	29·242	52·7	46·2	49·1	47·9	59·6	44·5	S.W.	S W.	475	9·5	·16
10	28·921	50·2	43·4	46·0	43 8	57·8	40·6	S.W.	S.W.	200	10 0	·32
11	29·088	50·9	43·4	46·1	44·2	85·5	38·8	S.W.	S.W.	126	10·0	·10
12	·808	45·7	32·6	37·0	32·0	88·7	24·3	N.	E.	94	3·5	
13	·630	44·6	32·3	40·0	39·7	47·1	24·0	S.E.	S.E.	146	10·0	·36
14	·534	46·3	42·6	43·7	42·0	58 0	39·7	E.	E.	149	10·0	·38
15	·480	44·8	38·4	40·5	39·0	48·1	38·9	E.	S.E.	86	10·0	·20
16	·170	46·0	33 2	37·4	33·4	94·3	24·9	W.	W.	215	4·5	·15
17	·034	45·3	32·3	36·2	32·2	96.7	25·1	N.W.	N.W.	106	5·0	·06
18	·285	43·5	29 2	34·9	31·5	92·7	22·5	W.	W.	137	4.5	·09
19	·386	44 7	33·2	36·9	32·6	91·9	28·3	S.W.	S.W.	178	5·0	·06
20	·174	41·1	30·2	33·9	29·0	89 8	24·1	S.W·	N.	187	9·5	·29
21	·254	39·8	25·6	30·6	27·5	87·7	21·2	N.	E.	78	9·5	
22	·410	35·6	20·9	29·2	28·9	63·5	18·6	E.	W.	85	10·0	
23	·628	37·0	21·4	28 5	25·7	82·6	19·6	W.	W.	111	9·5	·02
24	29·918	38·7	23 8	28·3	23·0	95·0	21·2	W.	N.W.	80	5·0	
25	30·074	35·7	23·6	30·0	23·7	72·5	17·7	N.	N.	121	5·5	·01
26	30·162	36·6	29.1	31·7	27·1	63·9	21·7	N.	N.W.	141	5·0	·06
27	29 946	43.1	28·0	36·0	35·6	54·0	21·3	W.	W.	62	10·0	·02
28	29·765	50·0	37·4	41.5	38·1	68·8	36·9	W.	N.W.	56	10·0	.48
Mns.	29·556	43·4	32.8	37·2	34·4	70·0	28·9	...	...	5171	8·4	4·75

MARCH, 1879.

Days of Month.	Mean Readg of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Dew Point.	Highst insun's rays.	Lowst on the grass.	Direction of the Wind A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10)	Rain.
	in.	°	°	°	°	°	°					in.
1	30·12	47·4	33·5	37·7	33·6	85·7	23·9	N.	N.	106	10·0	
2	30.147	48·8	27·3	36·7	30·5	96·7	19·0	W.	S.W.	80	0·0	
3	29·996	46·8	33·4	37·9	33·9	77·2	24·5	S.W.	S.W.	110	5·0	·02
4	30·107	46 9	30·8	39·8	38·0	76·5	21·3	S.W.	S.W.	128	8·5	·01
5	·011	52 8	43·7	47 8	45·0	95·0	41·7	S.W.	S.W.	300	5·0	·03
6	·311	54·0	33·1	41·2	34·3	101·3	25·0	W.	W.	125	0·0	
7	·578	55·7	30·2	40·7	35·5	106·5	22·2	W.	S.W.	36	1·0	
8	·552	55·7	30·3	41·6	35·7	103·2	21·7	N.E.	W.	72	0·0	
9	·495	59 5	30.2	43.5	39 9	106·0	22·6	W.	W.	87	0·0	
10	·391	51·9	37·1	44·9	42·0	95·1	29·0	S.W.	N.	185	2·5	.03
11	·396	50·7	39·2	43 7	37·2	104·4	31·9	N.W.	W.	165	5·5	
12	·130	50·8	32·7	42·7	40.1	79 5	25 6	S.W.	N.W.	239	10·0	
13	·397	44·8	27·6	34·3	21·8	98 3	20·8	N.	W.	100	5·0	·01
14	30·144	40·2	30·7	36·0	34 9	47·8	25·5	S.W.	S.W.	171	10·0	·09
15	29 778	47 0	36·0	41·3	35·5	90 0	30·6	S.W.	S.W.	130	6·0	·01
16	29·820	53·3	39·2	44·6	40·5	86·5	26·5	S.W.	W.	225	4·5	·04
17	30·061	46·1	34·2	40·6	39·8	62·0	25 3	E.	S.E.	142	10·0	
18	29 834	51·9	40·3	44·7	42·2	100·7	36·6	S.	E.	72	10·0	·02
19	·754	62·5	39 3	50·4	44·4	108·8	30·1	E.	N.E.	97	5·5	
20	·842	52·8	41·2	44·5	37·9	75·0	37 3	N.E.	N E.	123	10·0	
21	·865	48·0	37·2	40·7	36·3	100 5	31·6	N.E.	N.E.	148	8·5	·07
22	·820	40·5	32·4	34·7	30·5	44·0	28·1	N E.	N.E.	234	10·0	·02
23	·899	36·0	31·0	32·4	29·5	43 3	26·2	N.E.	N.E.	243	10·0	
24	·907	32·6	28·3	29·8	22·5	49·0	24·4	N.E.	N.E.	353	10·0	
25	·823	32·2	27·5	29·2	23·7	55·2	27·4	N.E.	N.E.	213	10·0	·04
26	·662	37·8	28·7	32·8	30·0	59·0	28·7	E.	N.E.	146	10·0	
27	·612	40·9	31·3	35·4	31·8	59·9	31·7	N.E.	N.E.	178	10·0	
28	·739	45·6	31·4	37·1	32·0	108·2	28 9	N.	S.E.	122	10·0	·10
29	·738	54·8	36·9	45·1	40·2	103·3	31·3	S.W.	S.W.	193	9·5	·21
30	.707	50·5	36·7	43·7	41·6	90·0	27·9	S.W.	S.W.	191	10·0	·23
31	29·646	53·7	40·6	46·1	40 9	101·7	36·4	S.W.	S.W.	128	8·5	
Mns	30.009	48·1	33·9	40.1	35·5	84·2	27.9	...	...	4842	6·9	0·93

APRIL, 1879.

Days of Month.	Mean Readg of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest	Adopted Mean.	Dew Point.	Highst insun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M	Velociey. Miles.	Mean amt. of Cloud (0-10)	Rain.
	ins.	°	°	°	°	°	°					in.
1	29·686	52·2	31·9	41·8	37·5	98·3	25·4	W.	S.W.	64	4.0	
2	·643	54·4	31·9	43·3	42·5	118·7	23·1	S.E.	W.	44	10 0	03
3	·671	51·0	31·8	40·2	35·6	95·0	26·6	N.W.	N.	72	8·0	
4	·853	54·0	29·0	42·5	36·2	103·7	21·6	W.	S.W.	85	3·0	
5	·754	50·7	39·7	45·6	44·1	73 0	34·7	S.W.	S.W.	153	7 0	·13
6	29·321	49·8	41·9	45·0	42·1	68·0	36·9	S.W.	S.W.	218	8·0	·69
7	28·937	55·1	41·9	47·9	44·4	103 0	38 0	S.W.	S.W.	225	8·5	·05
8	29·331	56 3	38 8	46·3	39·9	113·2	29·2	S.W.	S.W.	119	8·5	
9	·537	55·3	38·3	45·8	41·3	96·8	30·0	W.	N.W.	104	9·5	·22
10	29 887	44·7	34·1	38·6	34·5	55·1	33·7	E.	N.E.	363	10·0	
11	30·157	40·4	30·6	34·0	28·7	90·6	23·5	N.E.	N.W.	525	6·0	
12	29·868	37·4	27 2	32·1	31·5	58·0	18·4	W.	N.W.	57	10·0	·21
13	·632	43·6	29·2	35 3	29·6	95 1	30·8	N.E.	N.E.	122	10·0	·01
14	·570	42·7	30·8	36·5	33·9	75·0	26·8	N.E.	S.E.	290	10·0	·37
15	·548	46·0	32·2	37·7	35·3	106 7	30·1	N.E.	N.	147	6·0	·06
16	·598	43·7	33·8	37·5	33·5	79 2	26·0	N.	N.W.	81	5·5	
17	·739	52·0	31·8	41·4	35 7	111·5	25·2	N.W.	N.	78	4·5	
18	·960	50·5	28·8	39 5	33·4	110·0	16·6	N.E.	N.E.	71	1·5	
19	·793	49·1	30·2	40·1	36·0	105·1	19·2	E.	S.E.	139	0·5	·14
20	·426	57·2	38 6	45·8	42·4	10)·7	29·8	S.W.	E.	135	5·5	
21	·559	48·6	35·4	40·2	33·4	91·8	22·9	N.E.	N.E.	185	5·0	
22	·578	48·3	27·3	41·3	38·9	118·4	17·8	S.	S.W.	(7	7·5	·12
23	·501	53·7	41·0	46·3	44·4	90 1	40·7	E.	N.W.	90	10·0	·56
24	·969	49·9	42·2	45·0	43·1	72·8	31·9	N.W.	N.	74	10·0	
25	·997	54·7	38·2	46·5	43·5	96·0	27 9	S.	W.	106	5·0	·14
26	·685	56·9	41·9	48·6	42·8	111·7	36·2	W.	N.	128	3·0	·13
27	29·740	58·5	42·4	48·6	43·5	115·2	36·3	N.E.	N.	116	9·0	·05
28	30·088	50·2	40·1	44·7	33·8	92·2	32 5	N.	N.	138	5·0	
29	·343	54·8	34·0	45·1	37·7	118 2	27·2	N.E.	N.	81	6·5	
30	30·230	51·7	38·1	43·9	37·1	86·0	31·5	N.W.	N.	64	10·0	·48
Mns.	29·719	50·4	35·1	42·2	37·9	95 2	28·4	...	..	4141	6·9	3·39

MAY, 1879.

Days of Month.	Mean Readg of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest	Adopted Mean.	Dew Point.	Highst insun's rays.	Lowst. on the grass	Wind. Direction. A.M.	P.M	Velocity. Miles.	Mean amt. of Cloud (0-10).	Rain.
	ins.	°	°	°	°	°	°					in.
1	30 210	43·1	33·1	37·0	31·3	88·8	30·4	E.	N.E.	99	5·0	·27
2	·401	49·8	31·3	40·4	31·3	117·7	25 9	N.E.	N.	37	4·0	
3	·474	55·9	29·1	43·4	33·5	107 9	19 8	N.	N.E.	146	0·0	
4	·529	58·7	29·7	45·3	36·2	110·7	23·3	N.E	N.E.	98	0·0	
5	·451	65·6	31·3	49·6	39·8	118·5	24·6	N.	W.	83	0 0	·09
6	·145	52·4	39·6	43·8	36 8	116·9	30·7	N.	N.	117	4·5	
7	·112	46·7	30·1	38·3	31·0	104·4	23·5	N.E.	N.E.	122	4·0	·01
8	30 026	50·9	28 2	40·6	32·3	115·2	21·1	.N	N.	94	10·0	·01
9	29 849	54·9	38·3	45·1	38·7	100·5	35·2	N.	N.	138	8·0	
10	30 094	51·2	27·6	40·2	31·5	116·2	17·8	N.	N.W.	131	5·0	.02
11	·071	50·1	36·2	43·3	41·8	72·8	31·6	S.W.	S.W.	128	10·0	·05
12	·184	62·8	43·2	52·7	44·6	129·9	40.5	N.W.	N.W.	82	6·0	
13	30·075	53·7	43·8	48·6	45·2	100·0	32·7	S.W.	S.W.	89	6·0	·13
14	29·897	54·9	43·5	47·4	42·3	113·9	34·0	W.	N.W.	165	9·0	·11
15	30 072	55·6	39·9	47·2	39·3	108·8	33·5	N.W.	N.W.	264	9·0	·14
16	30·190	60·6	42·7	49·1	43·3	109·5	40 6	N.W.	W.	133	5·0	
17	29·898	58·9	42·3	50·5	44·7	111·4	34·1	S.	S.	148	9·0	·20
18	·631	56·4	46·2	50·5	47·1	92·8	46·0	S.	E.	120	9·5	·03
19	29.898	61·3	45·2	51·7	45·5	118·7	42·4	N.E.	W.	76	9·5	
20	30·043	66 3	47·3	55·6	45·7	129 4	42·5	N.W.	W.	91	9·0	
21	·149	66·3	49 5	56·2	49·0	124·6	48·8	S.W.	S.W.	109	9.5	·02
22	·125	61·7	46·1	53 7	48·5	96 8	41·5	S.W.	S W.	52	10·0	·05
23	·255	60·8	40·4	51 0	38·1	122·1	34·9	N.W.	N.W.	218	9·0	
24	30·148	64·6	44·5	54·5	48·0	122 7	40·3	N.W.	N.W.	150	9·5	·12
25	29·933	61·5	45 7	50 8	45 2	121·7	41·2	N.	W.	142	5·0	
26	·767	54·7	40·7	49·1	45·4	92·0	33·9	S.W.	S.W.	128	9·0	·16
27	·603	50·8	44·7	48·2	45·8	73·1	43·6	N.E.	N.E.	137	10·0	·61
28	·627	57·5	45·2	49·6	44·2	111 0	45 2	N.E.	S.	167	9·5	1·33
29	·689	58 6	42·8	49·8	44·0	101 9	42·4	S.	S.W.	106	6·0	
30	·811	60·0	46·4	52·1	45·8	121·1	40 7	S.	E.	144	6·0	·08
31	29·682	62·2	46·8	52 7	45·5	130·9	41·4	E.	W.	120	8·0	·01
Mns	30·033	57·0	40·0	48·0	41·3	109·7	35·0	...	...	3834	6·9	3·44

JUNE, 1879.

Days of Month.	Mean Readg of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest	Adopted Mean.	Dew Point.	Highst insun's rays.	Lowst. on the grass	Wind. Direction. A.M.	P.M.	Velocity Miles.	Mean amt of Cloud (0-10)	Rain.
	ins.	°	°	°	°	°	°					in.
1	29·625	57·7	45·7	51·0	47·1	97·1	42·5	S.W.	W.	131	6.5	·23
2	·630	56·9	45·3	51·0	49·3	88·8	41·6	S.W.	W.	131	9·5	·45
3	·672	54 7	45·4	49·9	45·5	76·2	41·1	N.W.	N.W.	86	7 5	·19
4	·922	63 8	38·7	52·0	47·0	124·2	32·6	W.	W.	98	6·5	
5	·803	67·0	49·9	57·5	45·8	124 7	35·9	E.	E.	124	10 0	·02
6	·752	66·4	51·1	57·0	52·6	108·7	50·5	S.	S.	112	9·0	·12
7	·650	57·7	52·4	54 8	53·1	73·0	49·8	S.	S.	104	10·0	·41
8	·582	64·3	52 0	56·7	51·8	124·8	48·8	S.	S.	110	9·5	·03
9	29·825	61·6	52·2	55·3	50·5	120·9	49·8	S.	S.W.	227	9·5	·06
10	30·052	65·6	50·1	56·4	48·0	127·9	43·2	S.W.	S.W.	113	3·5	·32
11	29·980	64·9	46·2	55·7	50·6	105·6	40·6	E.	E.	120	8·0	·12
12	29 972	61·6	50·3	55·0	51·3	111·5	46·0	S.W.	S.W.	120	9·0	·23
13	30·155	69·7	47·1	57·5	51·4	128 7	41·9	N.W.	S.	68	7·0	·22
14	30 077	64·4	49·0	57·2	53·2	109·0	45·7	S.	S.	125	9·0	·18
15	29·845	67·5	53·9	59·5	56·7	101·4	53·4	S.	S.W.	96	7·5	·17
16	·543	64·7	52·7	56·7	53 0	113·2	47 8	N.E.	W.	120	7·5	·34
17	·563	65·2	50 9	57·2	51·9	114·9	44 7	S.	W.	124	8·0	·01
18	·873	68·3	52 2	57 7	49·5	124·7	48·6	W.	W.	98	5·0	
19	·867	62·6	45·5	55·6	51·9	115·8	43·2	S.W.	SW.	159	10·0	·20
20	·845	65 7	53 3	59·4	51·6	114·7	53·6	S.W.	S.W.	46	9·5	·19
21	·690	61·1	52·2	55·3	51·5	103 8	51·5	S.W.	S.W.	246	10·0	·02
22	·917	63·5	48·7	54·6	45·7	117·1	44·2	S.W.	S.W.	232	5·0	
23	·824	59 9	47·0	53·3	47·5	110 2	41·4	S.W.	S.W.	165	10·0	·15
24	·632	63·2	49·3	55 5	48·2	119·7	45·1	S.W.	S.W.	136	9·0	·25
25	·673	64·7	48·1	54·1	46·4	120·7	44 4	S.W.	N.	113	4·5	·02
26	·752	62 0	45 3	53 3	50·7	97·3	38·8	S.E.	S.W.	135	9·0	·12
27	·823	64·6	53 5	58·7	55·3	90·2	46·4	S.W.	S.W.	256	10·0	
28	·868	67 9	54·3	59·2	50 6	125·0	49 7	S.W.	S.W.	239	5·0	
29	29 998	66·9	51 2	58·0	50 5	124 7	46 9	S.W.	S.W.	148	8·5	.06
30	30·038	67·2	47 4	57·2	49 0	125 9	42·6	S.W.	S.W.	228	9 0	·88
Mns.	29·815	63·7	49·4	55·7	50·2	111 2	45·0	..	...	4210	8·1	4·97

JULY, 1879.

Days of Month.	Mean Readg. of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Dew Point.	Highst insun's rays.	Lowst on the grass.	Direction of the Wind A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10)	Rain.
	in.	°	°	°	°	°	°					in.
1	29·403	63·7	51·7	55·8	51·2	117·5	48.7	S.W.	S.W.	660	10·0	·38
2	·624	63·2	49·3	55·2	47·5	122·5	46 0	W.	S.W.	224	9·0	·28
3	·524	59·9	48·1	52·6	48·1	93·7	45·5	E.	W.	169	7·0	·09
4	·781	62·5	48·4	53·6	49·4	112·0	43·6	W.	W.	218	8·5	·02
5	·955	60 3	49·5	54 8	46·5	113·7	47·6	W.	W.	213	9·0	·03
6	·962	60·9	49·6	54·9	52·6	90·7	46·7	W.	W.	148	10·0	·29
7	·719	65·2	52·6	57 1	50·7	116·7	50·7	W.	S.W.	178	9·0	
8	·491	61·0	48·3	54·1	49·2	113·3	43·3	S.W.	S.W.	231	10·0	·25
9	·594	61·0	50·3	54.7	47·5	106·7	49·6	S.W.	S.W.	264	9·0	·04
10	·895	64·0	50 0	55·6	46·6	124·2	44·5	S.W.	S.W.	186	5·0	
11	·991	65·9	44·0	55·9	48·9	127·4	37·6	W.	S.W.	118	9·0	·02
12	·686	60·4	51·1	55·7	51.7	101·5	49·6	S.W.	S.W.	126	8·0	·13
13	·487	64·7	50·9	56·9	51·0	120 7	46·7	S.W.	S.W.	132	8·0	·36
14	·611	60·9	51·6	54·9	51·1	91·0	51·7	S.W.	W.	106	10·0	·10
15	·864	64·7	51·1	57·7	52·2	115·9	45·6	N.	N.	77	9·5	
16	·875	63 4	49 0	55·3	51·8	114·0	44·0	S.W.	S.	79	10·0	·02
17	29·883	65 0	53·2	59·2	55·2	95·1	53 4	E.	E.	111	9·5	
18	30 048	71 0	53·3	62·9	56·9	133·6	56·4	E.	E.	70	9·0	·19
19	29·963	69·1	56 0	60·8	55·2	117·7	56·7	S.	S.W.	108	10·0	·71
20	·391	61·5	53.1	57·3	54·7	99·7	53 6	S.W.	W.	239	10·0	·29
21	·551	59 8	52·1	55·8	50·1	79 0	50·8	W.	W.	275	10·0	·15
22	29·794	61·5	53·0	56·2	52·0	100·6	52·1	N.	N.	202	8·5	
23	30·089	70 8	52·9	58·4	50·5	131·6	45·6	N.	N.	110	4.5	·03
24	·115	70·2	51.4	58·7	53·0	127·3	47·3	W.	W.	122	5·5	
25	·120	64·9	46·8	55·4	50·2	117·6	39·4	W.	W.	95	5·0	·06
26	·002	62·4	48·3	55·2	52·1	98 6	43·4	S.	N.W.	57	9·0	
27	·133	69·7	48 1	58 7	51·4	128·9	40 8	W.	W.	127	9·0	
28	·171	74·9	54 9	64·8	59·2	115·4	51·8	S.W.	W.	92	7·0	
29	30 011	77·5	56·3	66·2	60·9	136 9	54·2	S.E.	Calm.	104	4·5	
30	29 963	73·7	55·4	63·7	57·3	128·2	50 9	W.	S.W.	83	9·0	·22
31	29 874	68 9	60 1	62·6	58 5	119·4	57·7	S.	S.W.	88	9 5	·50
Mns	29·825	65·2	51·5	57·4	52·0	113·3	48.2	...	...	5015	8·4	4·16

AUGUST, 1879.

Days of Month.	Mean Readg of Baromtr. reduced to sea Level.	Temperature. In the Shade. Highest.	Lowest	Adopted Mean.	Dew Point.	Highst insun's rays	Lowst. on the grass.	Wind. Direction. A M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0..10)	Rain.
	ins.	°	°	°	°	°	°					in.
1	29 975	71·7	57·4	62·7	56·0	126·5	54·9	S.W.	N.W.	125	8·5	
2	30·089	68·9	50·2	59·7	51·4	117·7	43·0	N.E.	N.E.	122	5·5	·73
3	29·900	67·6	54·2	60·0	57·7	82 0	51·5	E.	S.W.	200	5·5	
4	30 014	67 0	53 9	58·6	52·7	117·9	47 0	W.	S.W.	113	4·5	
5	29 838	61·0	53 0	56·6	52·7	77·0	46 6	S.W.	S.W.	128	8 5	·38
6	·820	64·7	50 9	56 4	50·8	120·5	44 6	S.W.	S.W.	196	3·5	
7	·886	64·0	52·0	57·0	51·6	122·7	46·6	S.W.	W.	116	10 0	·02
8	·874	68·6	54 4	59 2	53·4	127·6	55·5	N.	N.	60	10 0	
9	29·997	65 0	50·6	57·0	48·0	125 6	44·8	N.	N.E.	68	4·0	
10	30·025	70·8	44·1	59 0	50 9	128·6	35·3	E.	E.	75	6·0	
11	30·005	70 7	56·3	63·2	58·8	99.5	57·5	E.	E.	126	10 0	
12	29·891	77·5	54·5	65 7	57·1	126·0	50·8	E.	E.	97	0·0	
13	29·866	74·7	54 8	64·0	56·1	120·5	52·4	S.E.	S.E.	97	9·5	·46
14	30·067	67·1	55·6	61·2	57·8	89·5	49 8	N.W.	N.W.	36	9·0	·02
15	29·917	75·4	55 2	63·7	58 1	128·4	51·8	N.W.	N.W.	48	8·5	·22
16	·609	67·3	52 9	57·8	53·9	112 0	49 8	E.	E.	88	5 0	·84
17	·617	56 6	51·4	53·4	50·0	67·9	50 9	E.	W.	208	9·0	·55
18	·719	68 5	49·7	57·9	50·7	124·6	48·9	S.W.	S.W.	134	7.5	
19	·823	62 1	50 9	56·2	54·0	81·9	47·3	S.	S.W.	93	10·0	1·46
20	·689	64 7	54 9	60·3	59·5	82·8	55 3	S.W.	S.W.	154	10 0	·09
21	·657	66 7	56·1	60·2	57·1	93·9	51·1	S.W.	S.W.	86	5·0	·06
22	·752	66·5	54·4	59·0	51·8	123·7	49·9	S.W.	W.	275	2·5	·13
23	·812	62·7	53·7	57 5	55 1	80·7	49·1	E.	W.	86	5·0	·07
24	·997	70·9	45 6	59·1	54·1	124·4	39·2	W.	S.W.	49	7·5	·02
25	·799	68·5	54·1	60·0	51·5	123·4	50·2	S.W.	S.W.	224	2·5	·02
26	·740	58·9	51·4	55·2	50·4	88·0	46·5	S.W.	S.W.	233	10·0	·71
27	·570	62·4	51·5	58·4	58·2	75·2	48·8	S.W.	S.W.	230	10·0	·60
28	·538	64·0	55·1	58·4	54·4	106·7	51·6	S W·	W.	252	10·0	·22
29	·819	64·5	51·4	56·5	50·4	118·7	42·9	W.	W.	246	8·5	·02
30	29 981	66·5	45·7	56·2	48·8	122·3	36·7	S.W.	W.	152	4·5	
31	30 186	63 7	46·3	53 3	44 4	120·1	39·2	W	W.	123	2·0	
Mns.	29·854	66·7	52·3	58·8	53·5	108 3	48·0	...	...	4240	6·8	6·62

SEPTEMBER, 1879.

Days of Month.	Mean Readg of Baromtr. reduced to Sea Level.	Temperature: In the Shade.						Wind.			Mean amt. of Cloud (0-10).	Rain.
		Highest.	Lowest	Adopted. Mean.	Dew Point.	Highst insun's rays.	Lowst. on the grass	Direction. A.M.	Direction. P.M	Velocity. Miles.		
	ins.	°	°	°	°	°	°					in.
1	30 491	66·9	35·2	51·5	44·7	127·3	30·2	N.	W.	27	0·5	
2	·414	67·7	38·4	53·0	44·7	120·2	32·7	S.W.	S.W.	91	1·0	
3	·191	70·7	42·4	56·2	49·6	123 0	31·8	S.W.	S.W.	76	0·5	
4	30·136	68·3	43·6	56·5	53·5	127·2	39·2	N.	N.E.	54	9·5	
5	29·991	63·8	52·0	57·9	54·2	93·7	48·1	E.	E.	78	9·5	·02
6	·781	66·4	54·0	58·1	53·2	96·1	45·1	E.	E.	69	5·0	
7	·596	63·7	50·8	56·8	53·7	90·2	41·2	S.	S.	116	5·0	·32
8	·628	63·1	47 0	55·1	49·8	118·1	37·8	S.W.	S.W.	195	6·5	·13
9	29 676	60·7	50·3	53·6	49·5	112·0	42·8	S.W.	S.W.	180	5·0	·16
10	30·053	64·1	44 9	54·1	49·1	118·8	34·9	N.W.	N.W.	155	4·5	.02
11	29·932	61·7	50·4	55·7	50·7	94·2	49·8	S.W.	S.W.	154	9·5	·20
12	·674	58·9	54·1	56·1	54·3	72·5	51.7	S.	S.	125	10·0	·37
13	·716	62·1	51·1	56·2	54·2	88·9	45·6	S.		99	8·5	·23
14	29·922	65·1	47·2	54·0	47·1	116·2	41·0	N.	N.	41	0·5	
15	30 020	68·5	39·0	54·2	49·1	124·8	34·2	N.W.	N.	50	1·0	
16	30·001	66·2	47·8	56·5	51·1	117·0	39·9	N.E.	N.E.	91	9·5	
17	29 953	61·7	53·3	57·2	55·7	78·0	50·7	N.E.	N.E.	102	10·0	·68
18	30·007	64·1	53 8	57·3	54 8	88·1	46·0	N.E	N.E.	38	10·0	
19	.168	63·8	47·0	54·7	52·9	85·5	42·8	N.		25	9·0	
20	30·109	65·8	51·1	57·3	51·1	122·7	45·3	S.W.	S.W.	113	1·0	
21	29·989	61·3	48·0	54·4	49·7	102·7	41·4	S.W.	S.W.	101	4.0	·01
22	·916	60·6	42·4	52·0	45·6	114·2	32·3	W.	W.	152	7·0	·72
23	·516	59·5	47·8	53 0	51·0	79·0	46·1	W.	N.W.	119	9·5	·64
24	29·588	61·6	45·4	50·6	44·5	114·7	42·9	N.	W.	134	10·0	·01
25	30·224	60·7	38·8	49 9	43·8	117·8	29·7	S.W.	S.W.	106	0·5	·01
26	·336	64·7	41·0	53·6	49·6	119·7	30·7	S.W.	W.	103	5·5	·06
27	·301	63·9	48·9	54·7	50·7	110·4	40·8	N.W.	S.W.	50	5·5	
28	·089	59·7	44·9	53·3	51·8	105·1	37·5	S.W.	S.W.	103	10·0	·40
29	·161	58·7	47·9	51·3	45·2	113·7	40·9	N.	N.W.	110	8·5	·05
30	30·092	61·3	47·4	53·6	51·5	...	42·1	E.	N.	138	10·0	·59
Mns	29·989	63·5	46·9	54·6	50·2		40·5	...	...	2990	6·2	3·97

OCTOBER, 1879.

Days of Month.	Mean Readg of Baromtr. reduced to sea Level.	Temperature. In the Shade. Highest.	Lowest	Adopted Mean.	Dew Point.	Highst insun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0--10)	Rain.
	ins.	°	°	°	°	°	°					in.
1	29·778	62·7	48·1	54·2	51·4	105·1	40·9	S.W.	S.W.	132	5·0	·07
2	29·950	58·6	44·2	49·4	45·7	115·7	36·3	S.W.	S.W.	118	10·0	·15
3	30·201	56·1	42·9	50·5	46·7	101 3	30·6	S.W.	S.W.	145	6·5	
4	·289	66·9	47·2	54·7	48·3	116·1	38·5	W.	W.	144	2·5	
5	·307	63·7	40·1	51·7	49·9	119 3	35·9	E.	E.	92	4·5	
6	·366	64·1	48·1	54·2	50·0	105 8	38 7	E.	E.	128	4·0	
7	·460	61·6	47·9	52·9	48·7	112·7	39·0	E.	E.	66	5.0	
8	·536	54·5	43·4	49 2	45·8	70·5	34·7	E.	E.	87	10·0	
9	·496	52·7	37·9	45·7	40·1	97·0	31·5	N.E.	N.	61	5·0	
10	·504	48·7	34·1	41·8	41·6	56·2	30·2	N.	N.	50	10·0	
11	·562	61·7	37·2	46·4	42·8	108.8	34·6	N.	N.	23	0 0	·01
12	·558	60·1	38·1	46 4	43·5	104·3	32·9	N.	N.E	43	10·0	·01
13	·406	50·7	41·5	44·7	42·8	63·2	43·2	W.	W.	46	10·0	·01
14	·193	52·2	44·4	48·6	47·2	63·0	45·8	N.W.	N.	96	10·0	·04
15	·262	51·7	33 4	39·9	33·8	63·2	24·7	N.E.	N.	89	5·0	
16	30·283	50·5	28 2	37·3	30·6	99·6	19·5	N.	N.	106	7·5	·02
17	29·906	55 9	31·7	45·9	45·0	90·0	24·1	S.W.	W.	121	4·5	
18	·959	56 5	42·2	49·1	44·6	100·7	33·9	N.W.	W.	118	9.0	·10
19	·595	57 9	50·4	54·1	51·0	65·7	48·2	S.W.	W.	242	10·0	·17
20	·559	55 7	39·5	46·0	39·5	108·4	30 8	N.W.	N.W.	266	3·0	·12
21	29·966	50 7	37·4	44·9	40·8	76·1	28·5	W.	W.	92	6·0	·10
22	30·011	55·9	45·2	50·4	48·6	67·9	43·1	S.W.	W.	82	10·0	·14
23	30 088	57·6	51·0	54 0	52 3	84 9	49·3	W.	S.W.	82	10·0	·05
24	29 786	58·7	49 3	53·7	50·0	91·7	48·2	S.W.	W.	86	9·5	·09
25	29·836	55 6	38 0	44·3	39·1	102·0	28·8	W.	...	94	0·5	
26	30·049	53·7	35·0	43·1	39 6	100 2	28 5	E.	E.	159	6 0	
27	·164	55·5	44·3	49·6	47·2	75·4	36·6	E.	N.E.	131	10 0	
28	·251	54·2	44·0	47·6	42·3	107·6	35·7	N.E.	N.E.	185	9·0	
29	·212	46·7	44·2	45·1	41·9	65·8	42 7	N.E.	E.	210	10·0	·01
30	249	50·0	44·9	47·0	42·8	60·0	44 0	N.E.	N.E.	196	10·0	
31	30 203	47·8	43·5	45·0	38 6	55·1	41·2	N.E.	N.E.	176	10·0	
Mns.	30·159	55·8	41·8	47·9	44·5	88·8	36·1	...	...	3659	7·2	1·09

NOVEMBER, 1879.

Days of Month.	Mean Readg of Barometr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest	Adopted Mean.	Dew Point.	Highst insun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity Miles.	Mean amt. of Cloud (0–10)	Rain.
	ins.	°	°	°	°	°	°					in.
1	30·183	47·7	35·4	40·6	37·3	60·0	34·9	N.E.	N.	110	10.0	·04
2	·333	43·2	29·6	35·1	28·5	84·2	24·0	N.W.	N.W.	127	0·5	
3	·481	48 6	33 7	41·4	38·5	89·0	26·3	N.W.	N.W.	65	5·0	
4	·591	47 8	42·2	44·3	40·5	53·6	37·0	N.W.	W.	58	10·0	
5	·586	52·3	37·3	42·7	37·1	87·1	28·1	W.	W.	83	5·0	
6	·578	51·5	33·5	42·6	39·2	89·9	23·8	W.	W.	94	4·5	
7	·639	50·9	43·7	46·8	42·4	62 9	35·0	W.	W.	78	10·0	
8	·564	48·8	38 2	43·8	41·0	54·3	29·9	N.W.	N.E.	29	10·0	
9	·355	49·3	45 3	46·8	43·1	52·8	43·0	S.	W.	97	10·0	·01
10	·219	51·8	42·9	46·2	41·7	62·0	36·3	W.	S.W.	84	9·5	·01
11	·023	47 6	37·3	41·1	38·2	66·1	32·7	S.W.	N.W.	127	8·0	·14
12	·047	47·5	35 6	40·6	32·0	76·4	26·8	N.W.	N.W.	228	4·5	
13	·261	45·6	31·8	36·3	29·4	...	22·6	N.W.	W.	101	0·0	
14	·395	42·9	24·1	30·4	25·0	...	14·7	W.	N.	23	0·0	
15	493	41·1	18·9	27·0	22·4	...	11·8	N.	W.	29	0·0	
16	·438	40·5	21·3	32·6	31·6	...	14·1	W.	W.	67	10·0	
17	·296	50·0	38·1	44·8	43·3	...	35 0	W.	N.W.	146	5·0	
18	·336	54 9	49 2	51·7	50·5	...	45·9	N.W.	N.W.	187	10·0	·02
19	·359	53·9	35·2	41·5	35·8	..	28·9	N.E.	N.	131	5·0	
20	30·106	38·1	31·0	33·5	29·0	...	25·0	N.	N.	148	9·5	·13
21	29·831	36·5	31·8	33·1	31·1	...	30·7	N.E.	N.	122	10·0	·01
22	30·019	35·2	29·2	31·5	29·0	...	26·4	N.	N.	88	4·0	
23	·045	48·8	24·8	34·3	31·4	...	19·3	N.	N.	88	5·5	·15
24	·114	38·8	33·9	36 0	34·4	...	32·2	N.E.	N.E.	101	10·0	·02
25	·238	38·9	33·6	35 9	33·1	...	27·5	E.	N.E.	149	9·5	·03
26	·200	36 7	31·4	32 9	29·3	...	29·3	N.E.	N.E.	163	9·5	·03
27	·137	38·2	28 1	33·3	32·2	...	22·1	N.	N.	102	5·0	
28	·095	40·2	30·0	34·0	30 0	...	21·7	N.	N.	112	5·0	
29	30 024	38·8	28 7	32·3	28·0	...	21·7	N.	N.	66	4·5	
30	29·906	36 8	22·3	27·8	23·6	...	10·9	N.W.	N.W.	20	0·0	
Mns.	30·261	44·8	33·3	38·0	34·3		27 3	...	...	2923	6·3	0·59

DECEMBER, 1879.

Days of Month.	Mean Readg. of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Dew Point.	Highst insun's rays.	Lowst on the grass.	Direction of the Wind P.M.	A.M.	Velocity. Miles.	Mean amt. of Cloud (0-10)	Rain.
	ins.	°	°	°	°	°	°					in.
1	29·840	35·3	22·1	28·4	22·6	...	11·2	N.W.	N.	214	5·5	
2	·930	34·8	16·2	22·1	18·2	...	7·6	N.E.	N.E.	50	0·5	
3	·798	30·0	15·7	22·3	19·0	51·8	7·2	N.E.	N.E.	108	0·0	
4	·593	29·3	20·8	24·1	17·4	46·1	16·8	N.E.	W.	199	1·0	
5	29·700	34·8	18·2	26·7	25·4	40·4	7·6	W.	W.	158	9·0	·04
6	30·157	36·7	21·9	27·7	24·8	78·0	10·7	N.E.	N.E.	95	4·5	
7	·530	33·6	13·4	23 2	21·9	43·0	6·0	N.	N.	36	7·0	
8	·570	37·5	27·4	31·8	25·3	44·8	15·5	N.W.	N.W.	42	4·5	
9	·584	34·0	17·3	26·4	24·3	38·2	11·4	S.	N.W.	34	10·0	·03
10	·530	38·2	29·8	33·5	32·6	43 0	28·0	N.W.	N.W.	30	5 0	
11	·653	35·8	18·7	25·5	23·5	55·6	11·0	N.W.	N.W.	37	5·5	
12	·734	37·7	28·4	32·0	29·8	44 2	26 0	W.	N.W.	29	10·0	
13	·751	37·9	29·4	33·5	32 0	41·1	22·7	N.W.	W.	28	10·0	
14	·564	39·9	31·8	36·4	34·3	42·3	22·8	S.W.	W.	56	10 0	
15	·523	41·6	36·3	38·5	37·5	43·2	33·4	W.	N.W.	35	10·0	·01
16	·490	37·7	27·8	32·3	31·1	43·6	27·3	N.W.	N.W.	39	10·0	
17	·630	32·8	22·6	25·7	23·6	47·0	16·3	N.W.	N.	47	5·0	
18	·635	37·6	24 6	32·0	31·4	40 9	16·2	N.	N.E.	129	10·0	
19	·629	33·9	30·3	32·0	31·3	40·5	30·6	N.E.	E.	158	10·0	
20	·482	33·8	28·7	30·8	29·8	38·6	29·2	E.	E.	124	10·0	
21	·357	38·9	28·3	34·0	33·3	38·0	28·8	E.	N.	103	10·0	·09
22	·628	47·5	28·8	35·7	33·2	83·6	17·8	N.	N.	42	2·5	
23	·706	33·7	23·6	31·3	30·5	43 6	14 5	N,	N.	61	10·0	
24	·467	41·9	29·2	35·6	33·9	79·7	27·0	N.	N.	73	10·0	
25	·593	40·9	29·6	33·4	31·5	65·8	30·1	N.	N.	38	10·0	·02
26	·480	37·0	28·6	32·2	29·1	43·7	28·9	S.E.	S.E.	110	9·5	
27	·333	39·6	28·6	34·8	33·4	42·6	28·5	S.W.	S.W.	149	9·5	·10
28	·033	53·3	38·2	47·9	46·6	53·1	34·5	S.W.	S.W.	349	10 0	·12
29	30 003	52·7	37·6	42·6	36·3	85·0	31·0	S.W.	S.W.	268	1·0	·04
30	29·790	43·2	32·2	38·0	33·2	53·4	28·9	S.W.	S.W.	326	5·0	·30
31	29·771	51·7	31·2	44·7	42·0	51·1	28 9	S.W.	S.W.	409	10·0	·34
Mns	30·338	38·7	26·4	32·1	29·6		21·2	...	...	3576	7·3	1·09

1879.

SUMMARY.

Month.	Mean Reading of the Barometer (reduced to Sea Level.)	Temperature. In the Shade. Highest.	Lowest.	Mean of all the Highest.	Mean of all the Lowest.	Adopted Mean.	Dew Point.	Mean of all the Highest in the Sun's rays.	Mean of all the Lowest on the Grass.	Degree of Humidity (Saturation=100).	Wind. Direction. Proportion of N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Velocity.	Amount of Cloud.	Rain. No. of days it fell.	Amount Collected.
	ins.	°	°	°	°	°	°	°	°										Miles.			ins.
January ...	30·045	49·0	14·7	35·4	26·5	30·3	26·4	51·8	23·3	88	1	12	10	0	1	2	3	2	...	7·9	12	4·01
February ...	29·556	52·7	20·9	43·4	32·8	37·2	34·4	70·0	28·9	93	3	2	5	1	1	8	5	3	5171	8·4	23	4·75
March	30·009	62·5	27·3	48·1	33·9	40·1	35·5	84·2	27·9	89	3	8	2	1	1	10	5	1	4842	6·9	15	0·93
April	29·719	58·5	27·2	50·4	35·1	42·2	37·9	95·2	28·4	86	5	6	2	2	1	6	3	5	4141	6·9	16	3·39
May	30·033	66 3	27·6	57·0	40·0	48·0	41·3	109·7	35·0	79	6	5	2	0	3	6	3	6	3834	6·9	19	3·44
June.....	29·815	69·7	38·7	63·7	49·4	55·7	50·2	111·2	45·0	85	0	1	2	0	7	14	4	2	4210	8·1	25	4·97
July	·825	77·5	44·0	65·2	51·5	57·4	52·0	113·3	48·2	85	3	0	3	0	3	11	11	0	5015	8·4	21	4·16
August	·854	77·5	44·1	66·7	52·3	58·8	53·5	108·3	48·0	85	1	2	5	1	1	12	6	3	4240	6·8	19	6·62
September ...	29·989	70 7	35·2	63·5	46·9	54·6	50·2	...	40·5	87	5	4	2	0	4	10	2	3	2990	6·2	18	3·97
October	30·159	66·9	28·2	55·8	41·8	47·9	43·3	88·8	36·1	89	5	5	7	0	0	5	7	2	3659	7·2	15	1·09
November ...	·261	54·9	19·8	44·8	33·3	38·0	34·3	...	27·3	91	9	4	1	0	0	1	8	7	2923	6·3	11	0·59
December ...	30·338	53·3	13·4	38·7	26·4	32·1	29·6	...	22·1	92	7	4	2	1	1	5	4	7	3576	7·3	10	1·09
Year	29·967	77·5	13·4	52·7	39·2	45·2	40·7	...	34·2	87·4	48	53	43	6	23	90	61	41	...	7·3	204	39·01

SUMMARY OF THE WEATHER FOR 1879.

JANUARY.

"The blackest month in all the year
Is the month of Janivier."

The severe weather which set in at the end of October, 1878, continued throughout this month the only mild days being the 1st, 3rd, 13th, 14th, and 15th. The following figures show that although more extreme temperatures have been registered, there has not been such a low mean for the month during the period that observations have been made at Marlborough :—

	Highest	Lowest	Mean. Highest	Mean. Lowest	Mean.
	°	°	°	°	°
1865.....	50·1	15·8	40·0	27·9	34·2
1866.....	52·0	16·1	46·9	35·0	41·2
1867.....	54·5	1·0	38·2	27·0	32·9
1868.....	52·8	19·8	41·7	31·9	36·7
1869.....	55·6	23·3	47·1	35·2	40·9
1870.....	50·8	14·8	42·7	32·1	37·3
1871.....	46·1	6·0	36·1	27·6	32·1
1872.....	53·2	25·2	45·7	35·4	40·1
1873.....	53·0	23·3	45·1	36·2	40.6
1874.....	52·2	25·3	47·1	34·5	40 7
1875.....	52·7	28·5	47·6	39·5	43·2
1876.....	53·3	19 9	42 0	31·1	36·2
1877.....	53·3	28·8	47·9	36·5	42·0
1878.....	54 7	25·3	45·0	35 6	39·7
1879.....	49·0	14 7	35·4	26·5	30.3

The highest temperature during the month was 49°0 on the 1st, the lowest 14°7 on the 12th, and the mean 30°3.

Atmospheric pressure was for the most part high, the mean being 30 045 ins. the highest 30 462 ins. occurred at 9 p m. on the 27th, and the lowest 29·422 ins. at 9 a m. on the 3rd. Rain fell on 12 days, the amount being 4 01 ins. which is about the average. Snow fell on 8 days, and fog occurred on 4 days.

FEBRUARY.

"At Candlemas day
Another winter is on his way"

The weather was cold from the 1st to the 5th, mild from the 6th to the 15th, and cold during the remainder of the month. The highest temperature was 54°7 on the 9th, the lowest 20°9 on the 22nd, and the mean 37°2.

Atmospheric pressure was very low throughout the month, the mean being 29·556 ins., the highest 30·206 ins. took place at 9 p.m. on the 26th, and the lowest 28·881 ins. at 9 a.m. on the 10th. The rainfall amounted to 4·75 ins. and was in excess of that of any previous February during the past 15 years. The number of rainy days was 23. Snow fell on 7 days, hail on one day, and fog occurred on 7 days.

MARCH.

"March many weathers"

The weather was changeable, short periods of cold and mild weather alternating with each other, that from the 22nd to the 28th being very cold. The highest temperature was 62°5 on the 19th, the lowest 27°3 on the 2nd, and the mean 40°1.

Atmospheric pressure was in excess and more uniform than that of the previous month, the mean being 30·009 ins., the highest 30.615 ins, took place at 9 p.m. on the 7th, and the lowest 29·596 at 9 a.m. on the 27th. The rainfall was much below the average, the total being 0 93 in., and the number of rainy days 15. Snow fell on 5 days, hail on one day, and fog occurred on two days. Lunar halos were seen on the 4th, 7th, and 31st.

APRIL.

"April wears a white hat"

The weather was generally cold throughout the month, the 11th to the 14th being especially so. The highest temperature was 58°5 on the 27th, the lowest 27°2 on the 12th, and the mean 42°2.

Atmospheric pressure was below the average, the mean being 29·719 ins.; the highest 30·348 ins. took place at 9 a.m. on the 29th, and the lowest 28·864 ins. at 9 a m. on the 7th, rain fell on 16 days, the amount being 3·39 ins., fog and snow occurred on 2 days, thunder was heard on the 27th, and a lunar halo seen on the 6th.

MAY.

"May; come she early or come she late
She'll make the cow to quake."

The weather generally throughout the month was wet and chilly. The highest temperature was 66°3 on the 20th and 21st, the lowest 27°6 on the 10th, and the mean 48°0.

Atmospheric pressure was higher and much more uniform than in the previous month, the mean being 30·033 ins., the highest 30 536 ins, took place at 9 p.m. on the 4th, and the lowest 29·568 ins. at 9 p.m. on the 22nd. Rain fell on 19 days, the amount being 3·44 ins., the greatest fall in 24 hours was 1·33 ins. on the 28th. About one foot of snow fell on the 1st, being the heaviest fall of the season; snow also fell on the 7th, and hail on the 28th.

JUNE.

"Midsummer rain,
Spoils hay and grain."

The weather throughout the whole of the month was dull, cold and wet. The highest temperature was 69°7 on the 13th, the lowest 38°7 on the 4th, and the mean 55°7.

Atmospheric pressure was uniformly low, the mean being 29·815 ins; the highest 30·174 ins. took place at 9 p m. on the 13th, and the lowest 29·522 ins. at 9 a.m. on the 17th. The total rainfall was greatly in excess of the average and amounted to 4·97 ins. with 25 rainy days. A thunder-storm with hail occurred on the 24th, thunder on the 3rd, and fog on the 6th and 16th.

JULY.

"No tempest, good July,
Lest the corn look ruely."

The weather was dull and wet, the only period of fine weather being from the 23rd to the 30th. The highest temperature was 77°5 on the 29th, the lowest 44°0 on the 11th, and the mean 57°4.

Atmospheric pressure continued low, the mean being 29·825 ins.; the highest 30·176 ins. occurred at 9 p.m on the 28th, and the lowest 29·317 ins. at 9 p.m. on the 20th. The rainfall still continued in excess of the average, the total fall being 4·16 ins., and the number of rainy days 21. Thunder was heard on the 10th.

AUGUST.

"When the sand doth feed the clay
England woe and well a day!"

With the exception of the 8th to the 13th, the weather was dull, cold and very wet. The highest temperature was 77°5 on the 12th, the lowest 44°1 on the 10th and the mean 58°8.

Atmospheric pressure was low, the mean being 29°854 ins.; the highest reading 30 311 ins. occurred at 9 p.m. on the 31st, and the lowest 29 519 ins. at 9 a.m. on the 28th. The rainfall amounted to 6·62 ins. and was greatly in excess of that of any previous August during the past 15 years. The greatest daily falls were: 1·46 in. on the 19th; 0 84 in. on the 16th; 0·73 in. on the 2nd; and 0·70 in. on the 26th. The number of rainy days was 19. A severe thunderstorm occurred during the evening of the 2nd and the early morning of the 3rd, and again on the 13th.

SEPTEMBER.

"A long harvest—a little corn."

The weather was comparatively fine and dry till the 20th, but dull and wet during the remainder of the month. The highest temperature was 70°7 on the 3rd, the lowest 35°2 on the 1st, and the mean 54°6.

Atmospheric pressure was higher than that of the preceding three months, the mean being 29·989 ins.; the highest 30·508 ins. took place at 9 p m. on the 1st, and the lowest 29·497 ins. at 9 p.m. on the 23rd. The total rainfall was 3·97 ins. with 18 rainy days. Fog occurred on 6 days.

OCTOBER.

"Dry your barley in October
Or you'll always be sober."

The weather was cool but much finer and drier than for several months past. The highest temperature was 66°9 on the 4th, the lowest 28°2 on the 16th and the mean 47°9.

Atmospheric pressure was above the average, the mean being 30·159 ins., the highest 30·579 ins. took place at 9 a.m. on the 12th, and the lowest 29·422 ins. at 9 a.m. on the 20th. The rainfall was small, the total amount being only 1·09 in. with 15 rainy days. Fog occurred on 6 days.

NOVEMBER.

"Here comes St. Martin on his white horse."

The weather, with the exception of a few days, was cold throughout the month, especially during the latter half. The highest temperature was 54°9 on the 18th, the lowest 19°8 on the 15th, and the mean 38°0.

Atmospheric pressure was considerably in excess of the average, the mean being 30·261 ins.; the highest 30·650 ins. took place at 9 p.m. on the 7th, and the lowest 29·823 ins. at 9 p.m. on the 21st. Very little rain fell during the month, the total amount being only 0°59 in. with 11 rainy days. Snow fell on 6 days and fog occurred on 1 day.

DECEMBER.

"St. Thomas grey, St. Thomas grey,
The longest night and shortest day."

The weather was cold till the 27th, especially so from the 1st to the 11th, but mild from the 28th to the 31st. The highest temperature was 53°3 on the 28th, the lowest 13°4 on the 7th, and the mean 32°1.

Atmospheric pressure was very high, the mean being 30·338 ins.; the highest was 30·803 ins. at 9 a.m. on the 23rd, and the lowest 29·572 ins. at 9 p.m. on the 4th. Rain fell on 10 days, the total amount being 1·09 in. Snow occurred on 4 days and hail on 1 day. Fog prevailed on 16 days.

BOYS ADMITTED JANUARY, 1875. RE-WEIGHED MARCH, 1877. RE-WEIGHED MARCH, 1879.

No.	Name.	Age. Years.	Form.	Height. ft. in.	Inc. in.	Weight. st. lb.	Inc. st. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
274	Alston, J.H.	17	Low. 5, 2	5 7½	4½	10 13	2 8½	22	½	32½	2½	11	1	14½	1
387	Bowlby, C.W. ...	17½	Mod. Up. 1	5 8½	4½	10 13½	2 3½	22½	½	33	1½	11	1½	14½	½
303	Coghlan, E.W. ...	16½	6th Form	5 5½	3½	9 13	1 12½	21½	½	34	3½	10½	1½	14	1
431	Cole, F.E.	16½	Up. Sh. b	5 2½	6	7 13	1 7½	21½	½	30½	2½	9	½	13	1
197	Davis, A.H.	16	Up. Sh. a	5 1	6½	7 10	2 3½	21	½	29½	2½	9	1½	12½	1½
422	Duncan, F.....	16	Low. 5, 1	5 4	3½	9 2½	1 12½	22	½	32½	1	10	1½	12½	½
390	Goddard, T.A. ...	17½	Mid. 5	5 2	3½	7 3½	1 1½	21½	0	29½	1½	8½	½	11½	0
207	Halcomb, F.T. ...	16½	Up. Sh. b	5 7	2½	9 8½	1 7½	22	0	30½	1½	10	½	13	½
44	Hitchcock, C. ...	18	6th Form	5 5	½	10 2½	6½	23½	1	33½	½	10½	—½	13	—½
4	Jones, E.B.H. ...	18	6th Form	6 0½	2½	11 4	1 10	23	½	33½	1½	9½	½	14	1
92	Lascelles, W.E. ...	16½	Mod. Up. 2	5 9½	4½	9 1½	1 11½	21½	½	31½	2	9	1	12½	½
107	Lascelles, G.R. ...	14½	Mod. M. 2	5 6	5½	9 9½	3 1½	22	½	31½	2½	8½	½	13	1
466	Lawford, H.B. ...	14½	Low. 5, 2	5 1½	3½	7 5	13	21½	0	27½	—½	8½	½	13	½
162	Martineau, S.....	16	Mod. Up. 2	5 5½	5½	8 8½	2 2½	21	0	30½	1½	9½	½	13½	½
246	Nash, F.P.	17½	Mid. 5	5 9	1½	10 0	5½	21½	0	33	1	9½	—½	14	½
388	Nicholetts, J.....	16½	Mid. 4, a	5 8½	3½	10 9	1 8½	22½	½	33	1	10	½	14½	½
239	Orger, L.A.	17	Low. 5, 1	5 6½	3½	9 13½	1 12½	22	½	33½	3½	9½	1	13½	½
379	Richards, W.M....	16	Mid. 4, b	5 11½	4½	11 0	2 5½	22	½	33	3	10	1½	14	1½
554	Robinson, F.S. ...	16½	Up. 5	5 1½	4	6 13	13	21½	½	30½	1½	7½	0	11½	½
68	Saunders, A.N. ...	15½	Up. Sh. b	4 10½	4½	6 8½	1 5½	21	0	28½	2½	8½	1	11½	1

BOYS WEIGHED MAY, 1875. RE-WEIGHED MAY, 1877. WEIGHED AGAIN, 1879.

No.	Name.	Age. Years.	Form.	Height. ft.	in.	Inc. in.	Weight. st.	lb.	Inc. st.	lb.	Head in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
52	Bullock, S.L.	14½	Low. 4	5	1	3¼	6	12		13	21¾	¼	27½	1½	8	0	10¾	¼
476	Butler, G.W.	17¾	6th Form	4	10½	1	6	2½		9	22½	0	28¼	1¼	7	0	11½	½
242	Elgood, P.G.	15¼	Low. 5, 2	5	7½	4½	9	11	1	7½	22½	½	31¼	2¼	9½	½	13½	½
399	Fanshawe, R.....	15½	Mod. M. 1	5	1¼	3½	6	13½	1	0¼	21½	0	26¼	¼	8¼	¼	12	½
520	Hardwick, H.G.C.	16½	Up. 4, b	5	8¼	3½	10	8¼	1	11½	23¼	½	32½	2½	10	¼	14¼	¼
27	Hawkins, J.E. ...	15¼	Mod. L. 2	5	1	3¼	7	0½	1	1½	21¾	½	28	1	8½	¼	12	1½
204	Kirkpatrick, G.A.	13½	Low. 5, 2	4	10¼	2¾	6	5		10½	21¾	0	29½	1	8½	½	11	0
396	Pinder, F.H.	17	6th Form	5	6½	4½	9	8	2	4	22¼	¼	32¾	3¼	10	2	13½	1
241	Smith, S.	16½	Mod. M. 2	5	4¼	4¼	9	9½	2	0	22¼	¼	31	3	9¼	1	14¼	¼
124	Ward, E.....	13½	Low. 5, 1	5	5½	6	8	9	2	6½	22	½	31	5½	9½	1¼	13	1¼
180	Westcott, G.H. ...	17	Up. 5	5	1	5½	8	3½	2	1½	21¾	½	29	2	9¼	1	13	1
218	Williams, A.W.A.	14¼	Up. 4, b	4	9¼	4¼	7	3	1	9½	22	½	29	2	8½	¼	12	1
336	Yorke, R.F.	16¼	Mod. M. 1	5	10	7	9	13	2	6½	21¾	¼	31½	3½	10	1½	13¼	1¼
383	Youngs, L.....	15½	Up. 4, b	5	6	6¼	9	7	2	3¼	23	¾	30½	3½	9½	1	13	1¼

BOYS WEIGHED OCTOBER, 1875. RE-WEIGHED OCTOBER, 1877, AND AGAIN IN 1879.

No.	Name.	Age. Years.	Form.	Height. ft. in.	Inc. in.	Weight. st. lb.	Inc. st. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
105	Baker, S.R.	17¾	6th Form	5 6¾	1¾	9 11	1 4½	22½	½	32½	2½	9¾	1½	14	¾
392	Beaumont, F.L.M.	17¼	Mod. M. 1	5 10	5	11 8½	2 12	22¾	½	32½	2½	10¾	1	15	1½
537	Booth, C.L.	17¼	Mid. 5	5 9	3½	10 9½	2 0½	21¾	½	35¾	5	11¼	2	13	¼
417	Braddyll, H.E. ...	17¾	Low. 5, 2	5 5	4½	7 5½	1 4½	21	0	28¾	2¾	8	½	12¼	¾
572	Carr, W.....	17¼	Mid. 5	5 6	6	8 5½	1 11¼	22½	½	30½	3½	9	¾	12	½
420	Cooper, H.J.	15½	Up. 4, b.	5 3¼	3¼	7 11½	12¼	22¼	¼	29½	½	8½	½	12	½
164	Daltry, V.G.	17¾	Low. 5, 1	5 6	5¼	9 9	2 0½	22	¼	32	3¼	9½	1	13½	1
339	Dickinson, A.E...	15¾	Mod. M. 1	5 9½	7	9 2½	2 2	22½	½	29	½	9¼	¾	12	½
378	Eden, R.H.H. ...	15¾	Mod. M. 2	5 5¼	6½	9 5¼	2 7¼	21¾	½	30	3	9½	1½	13¾	1¾
502	Elder, H.M.	18¼	6th Form	5 8	½	12 3	1 0½	22¾	½	35	—1	11½	½	14½	0
371	Fox, R.F.	16	Low. 5, 1	5 2½	4½	7 8¾	1 2½	21¾	¼	28	½	8¾	½	12½	½
152	Gunner, E.J.	17½	6th Form	5 10	1¾	11 4½	1 0	22¼	¼	34½	3	10¾	¾	14¾	0
38	Heaton, E	18	6th Form	5 10¾	½	10 11	9¼	22¾	0	33¾	0	11	½	13¼	¼
536	Lowder, E.G.....	17	Low. 5, 1	5 6	5¼	7 13	1 5	22	½	28½	2	8¼	½	11¾	½
259	Mullins, E.P.	16½	Mod. M. 1	5 0¼	4¾	7 10¼	1 5¾	21½	½	29½	2	8½	½	12½	¾
441	Roper, A.W.	17	6th Form	5 6¼	5¼	8 9½	1 11½	22½	½	31	2¾	8½	¼	13	1
242	Swann, S.	16¾	Mod. Up. 2	5 11	4	11 11	2 2	22¾	¼	35½	4	10¾	1¼	14	½
42	Taylor, W.B.	18	6th Form	5 11¼	½	11 5½	12½	22	0	33	2¾	11	¾	13¾	0
556	Thompson, R.B....	17	Mid. 5	5 7¾	2¼	9 12½	1 4¼	22½	½	33½	2½	9½	½	13¼	½
434	Vans-Agnew, F.	17	Mod. Up. 1	5 10	6	10 8½	3 2¼	22½	½	33½	4	9½	1½	13¾	1¾
552	Wright, H.F.	15½	Up. 4, a	5 2	4¼	7 2	1 2	22	½	30	3	8¾	½	11½	1
203	Yeatman, A.W....	17¼	6th Form	5 4¾	1¾	8 10	1 2	21¾	¼	31	2	9½	1¼	13	¼

BOYS ADMITTED AND WEIGHED, JANUARY, 1877. RE-WEIGHED MARCH, 1879.

No.	Name.	Age. Years.	Form.	Height. ft. in.	Inc. in.	Weight. st. lb.	Inc. st. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
466	A'Court, W.F.H.	16¼	Up. 4, b	5 3¾	5¼	8 12¾	1 12¾	21½	½	29¾	2½	9½	½	13½	1
159	Bacon, J.S.F.....	14	Low. 5, 1	4 10½	4	6 5½	1 2½	22¼	¼	26½	¼	8	1	12	¼
562	Boucher, B.H. ...	15	Mod. L. 2	5 2	6¼	8 6	2 4	22¼	½	30	3½	8½	½	12¾	1¼
493	Brunton, E.	16½	Up. Sh. a	5 9½	1¾	10 7	1 2½	23	0	33	½	10	—½	13	1
224	Burgess, A.J.....	14½	Mod. M. 2	5 6½	4¾	9 8½	1 12¼	22¼	¼	30	1½	11	1¼	14	1
53	Cardew, R.K.....	16¼	Up. 5	5 1½	3¾	6 13¼	1 0¾	21½	0	29½	2	7¾	¼	11½	¼
109	Clayton, A.G.....	14½	Mod. M. 2	5 2	3	7 4½	1 1½	21½	¼	29	2	8	½	13	1¼
155	Dumbleton, A.S.	15½	Mid. 4, b	4 10½	3¾	5 13½	13	21¾	¼	27¾	1½	8	¾	10½	½
473	Foot, E.C.	16½	Low. 5, 1	5 8½	5¼	10 2	2 4	23	½	30¼	3¼	9½	¾	13¾	1¼
477	Fitz-Roy, C.N. ...	16	Mod. Up. 1	5 5	5¼	8 10¾	2 1¼	21¼	¼	33¼	3¾	9½	1	12¾	¾
41	French, H.D.D. ...	16	Mod. M. 1	5 8½	4	9 9	1 9	22¼	¼	32	2¾	9	¼	13	0
28	Hobhouse, L.T. ...	14½	Up. 5	5 0½	3½	6 12½	13½	22	¼	26¼	¼	8	¼	11¾	¾
195	Jacob, J.L.....	14	Mid. 4, b	4 11	3	6 12½	1 6¼	21½	½	27½	1½	8	1	11¾	1
95	Koelle, C.P.	14½	Mod. Up. 1	5 1	5¼	7 4½	1 4½	21¾	¼	29¾	1¾	8¼	¼	11½	½
457	Kynaston, E.....	14½	Up. 3	5 3	4¾	8 3½	2 1½	21¾	¾	29	3½	9½	2	13¾	1¾
492	Lowenthal, C.F.	16½	Mod. Up. 2	5 11½	10¼	8 1½	1 3	22¼	0	30	1½	8	—¼	12¼	0
278	Mahon, E.	16½	Low. 5, 1	5 5½	4¼	10 1	2 4½	22½	¾	33	4	10	1½	13½	½
135	Meyrick-Jones, A.	16	Up. Sh. a	4 11½	3¼	7 3	12¼	21¼	¼	28½	¾	9	1	12¾	¼
231	Nott, F.W.....	16½	Mod. Up. 2	5 7½	5¼	10 8½	2 4½	22¼	½	34¼	1¾	9¼	1¼	14¼	1¾
453	Orde, E.L.	15½	Mod. M. 1	5 1½	4¼	6 8½	1 0½	22	½	26½	2	8	½	11½	¾
404	Parnall, R.B.....	16¼	Mod. Up. 2	4 10	3	6 13	1 0	21¾	¼	28½	1½	8¾	¾	12	¾
454	Petter, W.D.H. ...	15½	Mid. 4, a	5 5¾	5½	8 12	1 13	22	1	30½	2¾	9¾	1	12¾	¾

No.	Name	Age. Years.	Form.	Height. ft.	in.	Inc. in.	Weight. st.	lb.	Inc. st.	lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
180	Power, K.H.	16¼	Low. 5, 2	5	6¼	6¼	9	1	2	5	22	¼	30¾	3¾	9¼	1¼	13	1¼
205	Robinson, W.H....	15¼	Mod. Up. 1	5	2¾	3	7	7½		6	21½	¼	29	2½	8¼	¼	12	1
206	Robinson, F.O. ...	14½	Mod. M. 1	5	1¼	3¼	6	9½		11½	21½	¼	27	1	8	0	11¼	—¼
184	Sheppard, P.A.S.	15½	Mod. M. 1	5	3½	3½	7	12	1	6	21	0	28½	1¼	7¾	¼	12	¾
412	Sumner, C.H.....	16¼	Low. 5, 2	5	6¾	6¼	9	2¼	2	0¼	21½	¼	31½	2	8½	¼	13½	¼
547	Thompson, G.E....	15	Up. 4, a	5	5½	5¼	9	7	2	0¼	22	¼	31½	3½	9½	1¼	13½	¾
497	Tritton, V.B.	16¼	Up. 4, b	5	3½	3½	8	10	1	5¾	21¼	0	31¼	1¾	9½	¼	13½	¼
101	Turner, L.A.	14½	Mod. L. 1	5	5½	6½	9	3½	2	6	21½	0	31½	3¼	9	1¼	13½	1½
442	Villiers, C.H.....	16½	Up. 4, a	5	9	5½	9	11	2	4	21½	¼	32	3	9	¼	13	1
312	Winder, R.C.....	16	Up. 4, a	5	1½	2¾	6	2½		10½	21½	0	26½	¼	7¼	¼	11	0
54	Wood, H.E.	14½	Low. 5, 1	5	3	4¾	7	3½	1	10¾	20¾	¼	28½	3½	8½	1	12	1

BOYS WEIGHED MAY, 1877. RE-WEIGHED, 1879.

503	Alexander, D.H.B.	16¼	Mod. M. 1	5	7½	7	9	10½	2	11¼	22	¼	31	3	9¾	1¼	13¾	1¼
136	Arbuthnot, G.H.	14¾	Mod. L. 2	5	0¾	6	7	4½	1	9½	20¾	¼	27	1	8¼	¾	12	1
313	Boulton, W.W. ...	13¾	Low. 3	4	10½	4¾	7	7	1	6	21	¼	30	3½	9¾	1¼	12½	1
292	Cannon, P.H.....	12¾	Low. 3	4	8½	3	5	13		12	20¾	0	26	1¾	7½	¾	11½	½
543	Cunningham, R.H.	14¾	Mod. L. 1	5	1	3½	7	0		11	21¼	¼	28	1½	8½	¼	11¼	½
118	DeJersey, W.B....	16	Up. Sh. b	5	3	4	7	3		12	21	0	29	1¼	8¼	½	12	½
563	Druitt, A.	15¾	Low. 5, 1	5	8	3¼	10	2¼	1	10¾	22¼	¼	33	2½	9¾	1	13	½
196	Ducat, C.T.	15	Up. Sh. a	5	2¾	7¾	7	13¼	2	7¼	21	¾	28½	4½	8¼	1	12¼	1¾
89	Elling, R.	15¾	Up. 4, a	5	6½	5	9	1¾	1	12¼	21¼	¾	30¾	3¾	9½	¾	13½	1

No.	Name.	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. st.	Inc. lb.	Head in.	Inc in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
408	Fox, W.H.	15½	Up. Sh. b	5	0	3	6	10½		10	21½	0	29	1	8	0	11	⅛
459	Fox, G.....	13½	Mod. M. 2	4	8	3	6	4½	1	1	22	0	27	2	8	⅛	11½	¼
80	Harrison, T.D.W.H.	15¾	Up. 4, b	5	9¼	5¼	9	12	2	7¾	21¾	⅛	32	4¼	9½	1¼	12¼	¼
438	Haughton, W.J....	15½	Mod. M. 1	5	9	6½	9	11	2	5¼	22¼	⅛	32½	3½	9	1	14¼	1¾
561	James, H.H.	16	Mod. L. 1	5	5	5	7	13½	1	8	21¾	¼	28½	2¼	8½	1	11	1
307	Juckes, T.G.	15	Up. 4, a	5	2	3¼	8	1	1	2½	23½	⅛	30½	4¾	9	1¼	12	⅛
364	Larkworthy, G.C.	15½	Up. Sh. b.	5	2¾	4⅛	7	7½	1	7½	21¾	¼	29½	3	8¾	1	12½	1
168	Leach, F.	15¾	Up. 3	5	5½	5½	8	7	1	11½	22	⅛	31	3½	8½	⅛	12¼	1
248	Leigh, J.R.....	16¾	Mid. 5	5	5¾	5	8	2	1	3¾	21¾	⅛	29½	⅛	9¼	1¼	13	1
237	Middlemist, H.W.	16½	Mod. M. 1	5	7¼	1⅛	10	0¾	1	6¼	22½	⅛	33	2¾	10	1¼	11¼	0
98	Nicholson, W.E...	13	Up. 3			?	4	9½		8¾	20¾	0	24¾	0	6½	⅛	9½	⅛
320	Pawle, E.D.	14¾	Mid. 4, a	5	3¼	5¾	8	9	2	3½	21½	⅛	29¾	2¾	9	⅛	12¾	1
388	Prest, E.P.....	15¼	Mod. Up. 2	5	5	5⅛	8	12	2	4	22¼	⅛	30⅛	2⅛	9	1	14	2¼
260	Ravenhill, H.R....	14½	Mod. M. 1	5	2¼	6¾	8	0	2	5¼	22½	1¼	28	2½	9¼	1½	12	1¼
325	Reiss, H.J.	14¾	Up. Sh. a	5	1	5⅛	7	6	1	7	21¾	¼	27½	2	8¾	0	12¾	1
48	Ricardo, W.C. ...	15	Mid. 4, b	5	7	2¼	8	9¼	1	8¾	22¼	⅛	29¾	2¾	9¾	1¼	12¼	¼
504	Steel, E.E.	14¾	Mod. L. 2	5	0	3¼	6	12½	1	1½	21¾	⅛	27	1	8	⅛	11½	⅛
166	Stotherd, E.A.W.	15	Low. 4	5	3	4	7	6	1	0	21½	¼	27½	1½	8	¼	11¾	⅛
8	Tanqueray, A.H.	15	Low' 5, 1	5	7¾	5½	10	7½	2	6½	22	⅛	33¾	3¼	10½	1½	13¾	1¾
340	Tayleur, C.W. ...	15	Mod. M. 1	5	2¾	4¼	7	6¾	1	1¾	21¾	⅛	27¾	1¾	9	1¼	12	1
452	Tullock, C.	15	Low. 4	5	0½	2½	6	11¼		10¼	21½	⅛	28	1	7½	¼	11¾	¾
501	Walker, F.W.....	15	Up. Sh. a	4	11½	3½	6	9¾		13¾	21½	⅛	29½	3½	8	¼	12	⅛
407	Whatton, A.B.W.	16½	Up. Sh. a	5	6½	5	8	2½	1	10	20½	¼	29½	3½	8	⅛	12¾	1¼

BOYS ADMITTED AND WEIGHED, OCTOBER, 1877. RE-WEIGHED OCTOBER, 1879.

No.	Name.	Age. Years.	Form.	Height. ft. in.	Inc. in.	Weight. st. lb.	Inc. st. lb.	Head. in.	Inc. in	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
211	Adams, H.	16½	Mid. 4, b	5 9½	4½	10 8½	2 6½	22½	½	33	3	10	1½	14	1½
250	Adams, E.E.	14¾	Low. 3	5 0¾	5	6 8½	1 4½	21¾	½	28	1	7½	¾	10½	1
356	Adamson, A.C. ...	16½	Up. 4 a	5 7	3¾	8 13½	1 12½	21½	½	30½	2¾	9½	1¾	13	1½
49	Alderson, A.E. ...	16¼	Mod. M. 2	5 8¼	4¾	10 8	2 1½	21½	0	33½	3	9¾	1	14¼	1¼
480	Beaumont, H.C.C.	15¼	Mod. M. 1	5 6	6¾	9 9½	2 9	22	½	32½	2¾	10	2	13¼	1¼
357	Beeton, O.	15¾	Low. 5, 2	5 4¼	5¼	7 12¼	1 11¼	22	1	29½	1¾	8¾	1½	12½	1¼
401	Beeton, M.M.....	14½	Low. 5, 1	5 1½	3¾	7 5	1 0¾	21¾	¼	28½	½	8½	½	11¾	¾
458	Benson, R.P.	15¾	Mod. Up. 1	5 9	5¾	9 0	2 0½	22	½	29	2¼	8¾	1¼	12½	1
74	Bradburne, C.R.	13½	Low. 3	5 1¾	4¼	7 0½	1 4¼	21¾	¼	28½	2	8¼	¼	12¼	¼
574	Brinton, H.	16½	6th Form	5 5½	5½	8 11½	1 12¼	22½	1	29¾	¾	8¾	¾	12¾	1
249	Bryans, A.H.....	14	Low. 4	5 5¾	7¼	8 2¼	2 1¼	21¾	¼	32	5¼	9	1½	11½	¾
376	Cayley, W. de S.	16	Low. 5, 2	5 6½	4	9 4½	1 13	21½	½	31¼	3	9¾	¾	13½	1½
135	Chichester, A.G.D.V.	12¾	Mod. L. 2	4 6¾	3½	5 7½	12½	21½	½	26½	1½	8	¾	10¾	¾
12	Codrington, O.T.	14	Low. Sh.	4 11¾	4¾	6 8	12¼	21½	½	27¼	1¼	8¼	½	11½	1
131	Crompton, W. ...	15¾	Mid. 4, b	5 5½	5	8 10½	2 3¾	21¾	½	30	2¾	9¼	1¾	12¼	1½
565	Cunliffe, P.S.	16¾	Low. 5, 2	6 0	5½	11 1¼	2 2¼	22¾	¼	34½	4	11	1½	13½	1
10	Donne, J.R.	16¼	Up. Sh. b	5 7½	6½	8 9	1 10¼	22½	½	30	3	8½	½	12	¼
220	Earle, S.....	14½	Up. Sh. b	5 3¼	3½	8 4	1 1½	21¼	½	29½	1	9	¾	12¾	¾
1	Elliott, G.J.	15¼	Up. 5	5 0½	2¼	7 0	5½	22	0	29½	1½	8	¼	12½	½
115	Firth, E.C.C.....	12¾	Low. 5, 2	4 11¼	3½	6 10¾	1 5½	22	1	27½	1	8¼	1¼	11½	1
555	Forbes, D.	14½	Mod. M. 1	4 11	3¾	6 9½	1 2¼	21	0	28½	2½	8	½	12½	¾
564	Gordon-Mackenzie, C.G.	15¾	Mod. Up. 2	5 5	5	8 2½	1 11	21¾	½	28¼	1¼	8½	½	12½	1

No.	Name.	Age. Years.	Form.	Height. ft.	in.	Inc. in.	Weight. st.	lb.	Inc. st.	lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
254	Grant-Dalton, S.	15	Up. Sh. b	5	4½	5½	8	10½	1	6½	?	?	29	½	9½	½	13½	1
321	Hailes, D.A.	15½	Mod. M. 1	5	6	7	8	6½	2	3½	21½	1	30½	3½	8½	1	12½	1½
525	Hutton, P.E.S. ...	16	Up. Sh. b	5	3½	5½	8	4½	2	1½	21½	½	29½	1	9½	1½	12½	1
88	Innes, A.D.....	16	6th Form	5	3½	5½	7	1	1	11	21	½	27½	1½	8	1	13	1½
316	Laidlay, C.E. ...	15½	Low. 5, 2	5	4½	2½	8	13½	1	9½	22	½	30	2½	9	1½	12½	½
122	Latter, E.	16½	Mid. 5	5	5½	4½	8	8½	1	12½	22	½	29	2	9½	1½	13	1½
160	Law, A.W.A.	15½	Mod. L. 1	5	7	5	8	9	1	6½	21½	½	31	3½	8½	½	12½	½
76	Lewis, W.R.	15½	Up. 4, b	5	3	5½	7	10½	1	8	21½	½	27½	1½	8½	½	13	½
409	Luard, J.G.	16½	Up. Sh. a	5	8½	5½	9	6	1	13½	22½	½	30½	2	9½	½	13	1
72	Maclean, A.H.H.	15½	Up. 5	5	6½	3½	9	9	1	7½	22½	½	32½	3½	9½	1	13	½
19	Maddock, P.H. ...	16½	Up. 5	5	4½	4½	8	3½	1	8½	21½	½	30½	1½	8½	½	12½	1½
291	Martyn, A.W. ...	15½	Mod. M. 2	5	8	4½	10	9½	2	11½	22½	½	32½	2½	10½	2½	12½	1½
178	Mayo, C.R.....	14½	Low. 4	4	11½	3½	6	9½		13½	22½	½	28½	2	7½	½	11½	½
573	Millais, J.G.	14½	Low. 4	4	11	3½	5	13		9½	21	1	25½	0	7½	½	11½	½
153	Moore, W.	14½	Mid. 4, a	5	4½	3	7	10½		12	22	0	29½	2	8½	½	12	1
154	Moore, J.	13½	Up. 3rd	4	10½	3	6	8½		8½	21½	½	28	½	8½	½	11½	½
487	Mounsey, H.J. ...	16	Up. 4, b	5	5½	4	10	9½	1	11½	22½	½	32½	1½	10½	½	14½	1
172	Pedder, E.	14½	Low. 4	4	10	2	6	5		6½	21½	½	29½	2½	8	0	11	0
352	Richards, W.	16½	Mod. Up. 2	5	3½	6½	8	6½	2	2½	21½	0	30½	4	9½	1½	12½	1
18	Roberts, C.H.....	14	Up. 5	5	5½	3½	7	9		13½	21½	0	27	—½	8	½	12½	1⅝
227	Robertson, J.F....	16½	Mod. M. 2	5	10½	2½	11	6	1	8½	23½	½	33	2	11	1½	14½	½
437	Rogers, G.F.V. ...	15½	Up. Sh. b	5	0½	3½	6	12		10	22½	1	28	1	8½	½	11½	0
315	Rogers, W.A.F. ...	15	Up. Sh. b	5	5	5½	9	3½	2	1	22	½	31½	3½	8½	½	13½	½
295	Routledge, G.B....	14½	Up. 3	5	0½	3½	6	9½		11	21½	0	27½	1½	7½	½	11½	½

No.	Name.	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. st.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
147	Stanton, F.W.S.	16	Mod. Up. 1	5	8½	5½	11	5½	2	11½	23½	1	33½	3½	10½	1½	14½	1½
505	Stephenson, C.M.	16	Mod. M. 2	5	5½	5½	8	2½	1	12½	21	½	26½	½	8½	½	12	1
212	Stokes W.G.G. ...	16½	6th Form	5	5½	3½	9	1½	1	8½	22½	1	33½	3½	10	1½	13½	1½
58	Streatfield, W.C.	15	Up. Sh. b	4	11	3½	7	0	1	5	22	½	28½	2	8	½	12	1½
397	Tyler, C.W.....	14½	Mid. 4, a	5	0½	4½	7	6½	1	8½	21½	½	28½	1½	8½	½	12½	1
513	Vaughan-Johnson, B.	15½	Up. Sh. a	5	3½	5½	8	4½	2	3½	21½	½	31½	2½	8½	1½	13	1½
348	West, H	14½	Low. 4	4	11½	3	6	7½		13	21½	½	27½	½	8	½	11½	½
403	Wilson, H.H.....	15½	Mod. M. 1	5	8½	5½	8	13	1	10	22½	½	33	2	8½	½	12½	1
430	Wilson, J.E.B. ...	14½	Up. 4, b	5	2	6½	7	11	2	2½	22½	½	29	1	8½	1	13½	1½

BOYS ENTERED JANUARY, 1879. WEIGHED MARCH, 1879.

No.	Name.	Form.	House.	Born & Age.	Height. ft. in.	Weight. st. lbs.	Circumference of head. in.	chest. in.	arm. in.	leg. in.	Place of Birth.
363	Acton, J.	Low. 4	W.F.	Jan. 67—11¼	4 6½	5 9	21½	26½	7½	11½	Dorsetshire
506	Arnold, W. R.	Up. 3	W.E.M.	Aug. 65—13¼	5 3½	8 12	21½	31	9½	12	Devon
578	Askwith, H. F.	Mid. 4 a	F.E.T.	Dec. 65—13	4 10	6 6½	22	28½	7½	11½	Essex
85	Baker J. J. V.	Low. 4	C.S.	May 64—14½	4 8	5 10½	20½	26½	7	11½	Shropshire
235	Beresford, J. M.	Low Sh.	H.R.	Mar. 66—13	4 8½	5 8	21½	26	6½	10½	Bath
369	Berwick, H. C.	Up. 3	H.R.	June 65—13½	5 0	6 11	20½	27½	7½	11	Ceylon
361	Bett, H. C.	2nd Form	W.F.	May 67—11½	4 9½	6 2	20½	28	8	11	Surrey
232	Bird, H. B.	Low. 4	L E.U.	Mar. 64—15	4 8½	5 13½	21	27	7½	11	Cheshire
214	Blackall, H. O.	Mod. Low. 2	W.J.V.B.	Mar 65—14	5 2½	8 3½	21½	28½	9½	13	Kent
63	Bridges, T. C.	Low. 3	H.R.	Aug. 68—10½	4 5½	4 12½	21½	26½	6½	9½	Boynéres
138	Bryant, T. E.	Low. 4	C.S.	Aug. 64—14½	5 6½	8 13½	22	29½	9½	13	London
35	Buchanan, T. G.	Up. 4 a	H.B.H.	Feb. 66—13	4 11½	7 1	20½	29	7½	12	Wilts
215	Carpenter, E. C.	Low. 3	H.R.	Feb. 66—13	4 8½	6 10½	20½	27	8½	11½	Surrey
490	Cheales, J. P.	Up. 4 b	T.A.P.	Nov. 65—13	4 9	6 6½	21½	27½	8½	12	Lincolnshire
304	Chepmell, C. H.	Up. 4 a	W.M.	June 64—14½	4 11	7 6½	21½	28½	8½	12½	Paris
226	Christopherson, P.	Low. 4	H.B.H.	Mar. 66—13	4 9½	6 1	21½	26½	7	11	Kent
23	Daltry, B. H. R.	Up. Sh. a	L.E.U.	Mar. 65—14	5 6½	9 1	21½	29½	9	12½	Staffordshire
283	Davis, H. J.	Low. 3	W.F.	Ap. 67—11½	4 10	7 1	21	28½	8½	12½	Boulogne
557	Debenham, E. R.	Mid. 4 b	F.E.T.	May 65—13½	4 11½	6 2½	21½	25½	7½	10½	London
280	De Chair, R. B.	Low. 3	T.A.P.	May 66—12½	4 11½	7 2½	21	29	8	11½	Norfolk
22	Dupuis, C. E.	Up. Sh. b	L.E.U.	Sept. 64—14½	4 8	6 0	21	26½	7½	11	Surrey

No.	Name.	Form.	House.	Born & Age.	Height. ft.	Height. in.	Weight. st.	Weight. lb.	Circumference of head. ins.	Circumference of chest. in.	Circumference of arm. in.	Circumference of leg. in.	Place of Birth.
275	Ellershaw, E.	Up. 3	T.A.P.	Dec. 67—11	4	6¼	5	8¼	20½	25¾	7¼	9¾	Derbyshire
143	Farrar, E. M.	Up. 3	H.B.	Jan. 66—13	4	7½	5	7¾	20½	25½	7¾	10¼	Middlesex
24	Grace, G. H.	Low. 3	H.B.	Dec. 66—12	4	9½	6	3½	21	27	7¾	10¾	Somersetshire
252	Hamilton, J. Z.	Up. 4 b	W.M.	Jan. 65—14	4	9¾	6	8½	21	28½	8¼	12	Surrey
32	Hardy, W. E.	Mid. 4 a	H.B.	Feb. 66—13	4	9½	6	5	21	27½	7¾	11½	Salop
61	Hartley C.	Up. 4 b	L.E.U.	Feb. 65—14	4	9¾	6	7¾	21	27	8	11	Suffolk
571	Keeling, H. T.	Low. 4	F.E.T.	Ap. 65—13¾	5	3½	9	1	21	29	9	13½	London
190	Laurence, P. J.	Low. Sh.	H.B.	Feb. 67—12	4	7¾	6	0½	21½	27½	7	11	Kent
78	Lloyd, M. B.	Mid. 4 a	H.B.H.	Dec. 65—13	5	0	7	5¾	22¼	29	8½	12	Somersetshire
362	Mahon, G.	Low. 3	W.F.	Oct. 65—13¼	4	9	6	9½	22	29	8	12	Yorkshire
566	Mac Innes, B. S.	Mod. Low. 2	F.E.T.	Feb. 64—15	4	9½	6	4½	20¾	26½	7¼	12	Canada
567	Mac Innes, D. W.	Mid. 4 a	F.E.T.	Mar. 65—14	4	6¼	5	2	21	25¼	7	10	Canada
148	Maurice, G. T. K.	Low. Sh.	H.B.	Mar. 67—12	5	1	6	4	21¼	27½	7¾	10½	Wilts
284	Morley, J.	Up. 3	W.M.	Oct. 65—13¼	5	0	7	5	22	27	8	10½	London
112	Mullens, H. P.	Low. 4	H.B.	May 65—13½	5	1¼	7	2½	22	27¾	7¼	11¾	Wilts
219	Parsons, R.	2nd Form	T.A.P.	Mar. 68—11	4	3	4	7	21	24½	6¾	10	Nottinghamshire
330	Paul, E. M.	Up. 4 b	W.M.	Sept. 64—14½	4	9½	5	13½	21	27	7½	11½	Australia
544	Porter, A. L.	Mod. Low. 1	F.E.T.	Jan. 64—15	5	3¼	8	0	20¾	28½	8¾	12½	Somersetshire
2	Poynton, A. B.	Up. 4 a	H.B.	June 67—11¾	4	5¾	5	1¾	21	26	7	10¾	Somersetshire
150	Prescott, H. M.	Up. 3	H.B.	Mar. 66—13	5	1¾	7	7	22½	28¼	8¾	11½	London
66	Purcell, A. H. D'o	Mid. 4 a	L.E.U.	Aug. 65—13½	5	2¼	7	12½	22½	30	9	11	Devon

No.	Name.	Form.	House.	Born & Age.	Height. ft. in.	Weight. st. lbs.	Circumference of head. in.	chest. in.	arm. in.	leg. in.	Place of Birth.
308	Sim, G. A. C.	Mid. 4 a	W.M.	Aug. 65—13½	5 2½	7 8	21½	28½	8	11½	Punjaub
209	Tyler, G. E.	Low. 3	H.R.	Jan. 66—13	4 7	5 7½	21	26½	7½	10½	Monmouthshire
193	Vassall, H. G.	Mid. 4 b	H.B.H.	Jan. 65—14	5 0½	7 9	20½	30	8½	12	Glouc-stershire
236	Woodman, E. B.	Up. 3	H.R.	Oct. 65—13½	4 10½		21½	28	7½	11	Kent [Sept., 78
5	Parr, T. H.	Low. 5, 1	C.S.	Nov. 64—14	4 10½	6 7	21½	27½	8½	10½	Dorset. Admitted

BOYS ADMITTED APRIL 30, 1879. WEIGHED MAY, 1879.

274	Badcock, A. J.	Low. Sh.	T.A.P.	June 66—12½	4 6½	5 3	21	26½	7	10½	Landour Himalayas
581	Brooke, A. D.	Mod. Up. 2	F.E.T.	Oct. 65—13½	5 7½	10 4	23½	34½	10	14	Dublin
588	Brooking, A. H.	Up. 3	J.B.G.	Dec. 65—13½	5 2½	7 0	22	27	8	11½	London
271	Browne, G. H.	Low. 4	R.A.	July 66—12½	5' 1½	6 13½	21½	28½	7½	10½	Liverpool
337	Collett, B. S.	Up. 3	W.M.	Feb. 66—13	4 9	5 11½	20½	25½	7	11½	Middlesex
514	Colley, F. A.	Low. 4	W.E.M.	Mar. 65—14	4 10½	6 0½	21½	26½	7½		Sheffield
389	Cooper, G. E.	Low. Sh.	T.A.P.	July 66—12½	4 7½	5 8	21½	25	7½	11	Chili
486	Davis, E. H.	Up. 4 a	W.F.	July 65—13½	5 0½	7 11	22½	27½	8½	12	Boulogne
584	Doering, W. H.	Mod. Low. 2	J.B.G.	Nov. 64—14½	5 6	8 5½	22½	29	8½	13	Sussex
515	Feilden, G. N.	Up. 3	W.E.M.	Nov. 65—13½	5 1½	6 12½	20½	27	7½	11	Lancashire
482	Few, R. E.	Up. 3	F.E.T.	July 65—13½	4 10	6 1½	21	26	7½	12	Surrey
294	Fox, H. O.	Mod. Mid. 2	T.A.P.	Aug 65—13½	5 4½	7 6	22½	28½	7½	12½	Cornwall
466	Gamon, J. P.	Low. 4	W.F.	Mar. 65—14	5 0½	6 13	21	26	8½	12	Cheshire
194	Gregory, C. A. O. T.	2nd Form	T.A.P.	Ap. 67—12	4 6	5 5	20½	26	6½	10	London

No.	Name.	Form.	House.	Born & Age.	Height. ft. in.	Weight. st. lbs.	Circumference of head. in.	chest. in.	arm. in.	leg. in.	Place of Birth.
432	Gregson, L. S.	Mod. Low. 2	W.M.	Ap. 65—14	4 10½	6 0	20½	26	7	10	London
216	Grove, A. S.	Mid. 4 a	L.E.U.	July 64—14½	4 10½	6 3½	21½	26	8	11	Surrey
582	Hart-Dyke, R. P.	Mid. 4 b	J.B.G.	Nov 64—14½	4 10½	6 5	22	26	8	11½	Somersetshire
331	Home, J. A.	2nd Form	T.A.P.	June 66—12½	4 6½	5 3	21	25½	7½	10½	Kent
94	Jessett, G. F.	Mod. Low. 2	R.A.	Nov. 65—13½	4 8	6 3½	21	27	8	11	Hants
491	Krüger, J. C.	2nd Form	W.F.	Aug. 67—11½	4 6½	5 7½	21	25½	7½	11½	West Indies
497	Latham, W. H.	Low. 4	W.F.	Feb. 65—14	4 8	6 1½	20½	26	7½	11½	Cambridge
586	Leslie, B.	Mid. 4 a	J.B.G.	Oct. 65—13½	4 10½	6 0	21	26	7½	11½	London
513	McIlwraith, R. M.	Mid. 4 b	J.B.G.	July 65—13½	5 2	7 8½	21	29	8½	12	London
372	Mead, F. J.	Mod. Low. 2	W.M.	Sept. 65—13½	4 11½	6 12½	21½	26½	8	11½	London
158	Mellish, J. S.	Mod. Low. 1	H.B.H.	Aug. 64—14½	5 0	8 6	22½	28½	9	12½	Nottinghamshire
173	Nicholson, J.	Up. 3	R.A.	Nov. 66—12½	5 1	6 8½	21½	25	7½	11	Sussex
229	Pepys, H. F.	Up. 3	R.A.	May 65—13½	4 7½	5 9	20½	26	7½	11	Worcestershire
461	Proctor, R. G. C.	Low. Sh.	W.M.	May 68—10½	4 3½	4 9	20½	24	7	10½	Devon
117	Robertson, J. C.	Up. 3	R.A.	Ap. 66—13	5 0½	6 12	21½	27½	8	11½	London
219	Stileman, C. H.	Low. 4	R.A.	Jan. 65—14½	4 8½	6 2½	21½	27	8	12	Kent
199	Street, C.	2nd Form	R.A.	Aug. 66—12½	4 9½	6 8	21½	27	8½	11½	Burmah
350	Swinton, J. E. B.	Mod. Low. 2	W.M.	Aug. 64—14½	5 6½	8 2	21	28	8½	12½	Edinburgh
262	Teesdale, E. J.	Low. 3	R.A.	May 66—12½	4 8½	6 10	21½	26½	8½	12	Belgium
207	Villiers, W. N.	Low. 4	R.A.	Dec. 64—14½	5 3	7 9½	21½	28½	8	12½	Kent
378	Wansey, A. A.	Low. 4	W.M.	Aug. 65—13½	4 11½	7 1½	21	28	8	12	Somersetshire
587	Yeates, F. W.	Low. 4	J.B.G.	Dec. 65—13½	5 2	7 9	20½	29½	8½	12	London

BOYS ADMITTED SEPTEMBER, 1879. WEIGHED OCTOBER, 1879.

No.	*Name.*	*Form.*	*House.*	*Born & Age.*	*Height.* ft. in.	*Weight.* st. lbs.	*Circumference of* head. in.	chest. in.	arm. in.	leg. in.	*Place of Birth.*
246	Allen, J. W.	Low. 4	W.J.V.B.	Mar. 65—14½	5 6	9 6	22½	31½	8½	14	London
488	Archer, D. O.	Up. 3	F.E.T.	June 66—13½	4 10½	6 6	21	26½	8	11	Lancashire
288	Barrow, V. E.	Mod. L. 2	R.A.	Oct. 65—13¾	4 5½	6 1½	20	27	7¾	11¾	Madras
385	Beale, G. G.	2nd Form	Home-B.	July 68—11½	4 8	5 5¾	20½	25	7	11	London
336	Bell, H. L.	Low. 4	R.A.	Ap. 67—12½	4 7	5 8	21½	24	7	10½	Bengal
406	Bent, P. S.	2nd Form	T.A.P.	Jan. 67—12½	4 11	6 8½	21¾	26¾	7½	12	Worcestershire
419	Bere, M. A.	Low. Sh.	W.F.	Oct. 66—12¾	5 2½	6 12	21½	28	7½	11½	Devonshire
395	Birch, J. F. N.	Mod. Low. 2	W.F.	Dec. 65—13½	5 2½	7 11½	21½	28	8¼	12	Denbighshire
241	Bowly, D.	Up. 3	R.A.	Oct. 65—13¾	4 10½	6 5	21½	26½	7¾	11½	Gloucestershire
145	Bucknall, H. C.	2nd Form	R.A.	Sep. 66—13	4 8¾	6 5	21½	29½	8	11½	Lisbon
146	Bucknall, P. E.	2nd Form	R.A.	Aug. 67—12	4 6½	5 11½	21½	28	7¾	11	Lisbon
589	Bull, F. E.	Up. 4, a	Home-B.	Aug. 66—13	5 1½	7 6	22½	29	9	12	Wilts
548	Carey, E. V.	Mid. 4, a	J.B.G.	Feb. 65—14½	5 2½	7 9	22½	29	8½	12½	Ceylon
456	Cayley, D. L. A.	Mod. L. 1	W.M.	Sep. 64—15	5 0½	7 1½	21½	29½	8½	12½	Yorkshire
546	Chaine, W.	Mid. 4, a	J.B.G.	June 65—14½	5 5½	8 4	22½	28¾	8½	12½	Antrim
253	Clark, D. M. C. L.	Mod. L. 2	G.S.	Jan. 65—14½	5 0½	6 13½	21¾	29½	8	12	Punjaub
575	Collins, H. D.	Mod. L. 2	J.B.G.	Ap. 65—14½	4 10½	6 3¾	21½	26	8½	12	Yorkshire
302	Crookenden, C. P.	Mod. L. 2	H.B.H.	Sep. 65—14	4 11½	6 8	21¾	27	7¾	11	Woolwich
40	De Jersey, N. S.	Up. 3	R.A.	Jan. 66—13½	5 4	8 8½	22½	29½	9	12½	Guernsey
174	Dennis, L.	Mod. M. 2	M.H.G.	Jan. 65—14½	5 0¾	7 3¾	21½	28½	8½	12	Surrey
481	Du Maurier, G. L. B.	Low. 4	F.E.T.	May 65—14½	4 11	6 7	22	28	8	12	London

No.	Name.	Form.	House.	Born & Age.	Height. ft. in.	Weight. st. lbs.	Circumference of head. in.	chest. in.	arm. in.	leg. in.	Place of Birth.
239	Fairbairn, A. M.	Low. Sh.	R.A.	Nov. 66—12¾	4 11½	6 2	21½	26½	7¾	10½	Berks
25	Ffinden, G. C. F. A. S.	Up. 3	R.A.	Mar. 66—13¼	4 8½	6 4½	21	27¼	7¾	12	Bucks
20	Fox, L. W.	Up. Sh. b	H.B.H.	Sept. 65—14	4 8	6 4	20½	27½	8¼	11	Gloucestershire
84	Goodacre, H. G.	Mod. L. 2	M.H.G.	July 65—14¼	5 0½	6 9½	21½	28	8	11¼	Norfolk
355	Grenfell, W. T.	Up. 4, a	G.S.	Feb. 65—14½	5 1	7 9	22	29½	8¾	12	Cheshire
17	Harding, G. V.	Up. Sh. a	W.J.V.B.	Feb. 65—14½	5 4	8 11	22	30	9½	13¼	Monmouthshire
256	Hill, W. A.	Up. 3	R.A.	Feb. 66—13½	4 9½	6 8½	21¾	26½	7½	11	Herefordshire
367	Hill, T. H.	Low. Sh.	R.A.	May 67—12¼	4 7¼	5 10	21½	26¾	7½	10½	Herefordshire
323	Hughes, P. B. A.	Up. 3	R.A.	Feb. 66—13½	4 10	6 1	20½	26	7¾	10¾	Leicestershire
258	Hughes, F. H.	Low. 4	R.A.	Mar. 66—13½	5 0½	7 3½	21½	29	8	11½	Devonshire
100	Johnston, E. A. T.	2nd Form	R.A.	May 68—11¼	4 5	5 2½	21½	26	7¼	10¼	Northumberland
142	Lance, C. H.	Up. 3	R.A.	Nov. 65—13¾	4 11½	6 8½	21¾	26½	7¾	11½	Somersetshire
157	Lane, H.	Mod. L. 1	H.B.H.	Dec. 64—14½	5 1	6 4¾	20¾	26	7¾	11	Lucknow
4	Lias, C. R.	Up. 4, b	L.E.U.	Feb. 66—13½	4 7¼	6 0½	21½	27	8	11	Kent
50	Lister, A. H.	Mod. M. 1	M.H.G.	Nov. 64—14¾	5 3¾	7 11½	22¼	29½	8½	12	Essex
465	Marley, K. R.	Mid. 4, b	W.M.	Feb. 65—14½	5 2	8 5	21	30	8¾	12½	Durham
118	Maturin, C.	Mid. 4, a	L.E.U.	June 65—14¼	4 11½	7 2½	21¾	28	8½	12	Hants
590	Maurice, R. A.	Low. 3	Home-B.	Aug. 68—11	4 10½	6 4½	22¼	26	7¾	11	Wilts
140	Nicholson, C. L.	Mod. L. 1	M.H.G.	Nov. 65—13¾	4 8	5 13	21	27	7½	10¾	London
391	Nicholson, H. F.	Up. 3	R.A.	Nov. 65—13¾	4 10½	6 4½	21	26¾	8	11½	Yorkshire
523	Nowell, R. W.	Mod. M. 1	T.A.P.	Mar. 65—14½	5 5½	9 2	21½	30	9	13½	Calcutta
187	Ogbourne, L. C. W.	Low. Sh.	R.A.	Nov. 66—12¾	4 9½	5 10	21	25½	7½	10	Calcutta
44	Powles, F. J. E.	Mid. 4, a	R.A.	Feb. 67—12½	4 7¾	6 1½	21½	27½	8	11½	Gloucestershire

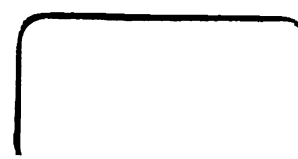
No.	Name.	Form.	House.	Born & Age.	Height. ft. in.	Weight. st. lb.	Circumference of head. in.	chest. in.	arm. in.	leg. in.	Place of Birth.
299	Preston, C. S.	Low. 5, 2	G.S.	Ap. 65—14½	5 5½	8 4	22	29	8½	13½	London
90	Rawlinson, C. B.	Mid. 4, b	L.E.U.	Ap. 66—13½	4 11	7 2	21½	27½	8½	12½	Oxford
524	Rendel, L. J.	Mod. M. 2	W.E.M.	Nov. 65—13½	5 4½	7 8½	21½	27½	8½	12	Northumberland
342	Reynolds, B. L.	Up. 3	R.A.	Aug. 66—13	4 6	6 2	21½	26½	8	11½	Bucks
413	Rickards, R. W.	Up. 3	T.A.P.	Oct. 65—13½	4 8½	5 10	22	26	7½	11	Cheshire
414	Rickards, H. B.	2nd Form	T.A.P.	Feb. 68—11½	4 5½	5 4½	20½	24½	7½	11½	Glamorganshire
106	Robertson, H. R.	Up. 4, a	H.B.H.	June 66—13½	5 5	8 6½	22½	30½	9½	13	Newry
428	Robertson, E.	Low. Sh.	W.F.	Jan. 67—12½	5 3	7 12½	22	30	8½	12½	Forfarshire
7	Sale, T. R.	Low. 5, 2	G.S.	Ap. 65—14½	5 2½	7 6½	21	28½	8	12	Yorkshire
493	Schilizzi, E. S.	Up. Sh. b	F.E.T.	June 65—14½	5 8	7 10	21½	30½	8½	12½	Lancashire
541	Sharpe, H. C.	Low. 5, 1	J.B.G.	July 65—14	5 7	8 12½	21½	30	9	13	London
485	Soden, A. S.	Mod. L. 1	F.E.T.	Aug. 65—14	4 8½	5 10½	20½	26½	8½	10½	Somersetshire
332	Tanner, J.	2nd Form	R.A.	Dec. 68—10½	4 4½	4 11	21½	25½	7	10½	Wilts
34	Tennant, H. L.	Mod. L. 2	W.J.V.B.	Mar. 66—13½	5 1	7 2	21½	28½	8	11½	Madras
127	Thruston, A. B.	Up. Sh. a	W.J.V.B.	Jan. 65—14½	4 10½	6 6	21½	28	7½	11	Gloucestershire
196	Thring, L. C. W.	Up. 4, a	R.A.	July 66—13	4 5½	4 11½	20½	26	6½	10½	Wilts
576	Townsend, B.	Mid. 4, a	J.B.G.	Ap. 65—14½	5 7½	9 4½	22½	31½	9½	13	London
318	Trethewy, T. L.	Up. 3	R.A.	May 67—12½	4 9	5 13	21	27½	7½	11	Bedfordshire
334	Ussher, B. G.	Up. 4, a	R.A.	Feb. 67—12½	4 7	5 10½	22½	26½	7½	11	Waterford
184	Vaughan, C. D.	2nd Form	R.A.	Aug. 68—11	4 6	5 6½	20½	25	7½	11	Cardiganshire
542	Waterfield, O. F.	Low. 5, 2	J.B.G.	Jan. 65—14½	5 7½	9 0½	22½	31	9	13	Surrey
237	Watson, C. F.	Mod. L. 2	L.E.U.	Oct. 65—13½	5 0½	6 12½	21	27½	8	12	Cumberland
431	Weston, W. K.	Low. 4	M.H.G.	Dec. 64—14½	5 4½	7 5	22	29½	7½	12	Dorset

No.	Name.	Form.	House.	Born & Age.	Height. ft. in.	Weight. st. lbs.	Circumference of head. in.	chest. in.	arm. in.	leg. in.	Place of Birth.
296	White, H. C. M.	Mod. L. 2	W.J.V.B.	Sep. 65—14	5 3½	8 4	22	29½	8½	12½	Lincolnshire
130	White, A. M.	Low. Sh.	R.A.	Aug. 67—12	4 7	5 9	22½	26½	8	11½	Lincolnshire
475	Williams, B. C. W.	Mod. M. 2	A.H.B.	May 65—14½	5 2½	7 8	21	28	8½	12½	Dorset
551	Wilson, J. S.	Up. 4, a	J.B.G.	Oct. 64—14½	5 0	6 4	21½	28	7½	10½	Hants
516	Wilson, H. G.	Low. 4	T.A.P.	Mar. 66—13½	4 11	6 2½	20½	26	7½	11	Surrey
151	Woolner, G.	Low. 3	R.A.	Nov. 67—11½	5 2	7 13½	21½	29	8½	12½	London
455	Yorke, P. C.	Low. 4	W.F.	Aug. 65—14	5 1	6 1½	20½	27½	7½	11	Herefordshire

ACCOUNTS.

RECEIPTS.	£	s.	d.
Balance from last account	11	2	0
Deposit and Interest	21	0	0
Subscriptions	13	12	6
Two Compositions	4	4	0
Donations—			
Mrs. Booth	4	0	0
Council	10	0	0
Sale of Reports	59	8	0
„ "Antiquities" ...	1	2	0
„ Maps	2	18	6
For Field Days	12	2	0
Tax (3 Terms).....	42	0	0
	£181	9	0

EXPENDITURE.	£	s.	d.
Subscription to Wilts Archæological Society	0	10	6
Cost of Report.....	59	19	0
Field Days	12	5	6
Prize	0	16	6
Library	3	15	7
Museum	4	4	9
Ditto Birds	28	4	11
Carriage of Parcels, &c....	2	14	4
Maps	5	13	8
Balance	63	4	3
	£181	9	0

With regard to the balance of £63 4s. 3d., it should be understood that £46 3s. will be absorbed by the expenses of the Report and stuffing specimens, for which special grants were given.

J. P. WAY,
Treasurer.